SULLIVAN COUNTY RECYCLING COLLECTION AND PROCESSING OPTIONS

EXECUTIVE SUMMARY

Background: This Study is a follow-up to the *Recycling-Based Waste Management Action Plan* produced by the Antioch New England Institute (ANEI) working in consultation with the Waste Action Collaborative of Sullivan County (WACSC). One of the principle recommendations of the Action Plan is the construction of a materials recovery facility to serve the communities of Sullivan County.

Projections of Recyclables for a County MRF: The most critical factor to the economic viability of a MRF for Sullivan County is the availability of material. Because of the high fixed costs of a MRF's building, equipment and labor, sufficient incoming material must be secured. For this study, we began by calculating potential in-County tons based on available data and on RRS benchmark recycling program data. We then estimated tons that could be available from adjacent Counties. For each of the processing scenarios we used the following estimates of tonnage for in-County tons.

SULLIVAN COUNTY RECYCLING RECOVERY ESTIMATES				
	Estimated Current MRF Tons	Future Dual Stream Tons	Future Dual Stream PAYT Tons	Future Single Stream PAYT Tons
TOTAL	**2,649**	**5,283**	**7,396**	**8,859**
Average MRF Material Generation Rate (Lbs/HH/Year)	263	525	735	881

The first column, Estimated Current MRF Tons, shows the existing recycling system and the tons that could be redirected to a MRF. The next three columns estimate tonnage increases based on advanced collection programs. For example, these estimates assume curbside recycling programs are initiated for the four largest towns: Claremont, Newport, Sunapee and Charlestown and the PAYT scenarios assume a pay-as-you-throw incentive system. The net result is the potential to generate nearly 9,000 tons per year of available in-County tons. Note that a detailed breakdown by town is in the report.

For out-of County tons, estimates of available material were also tabulated based on per household generation rates. We estimate that there are approximately 5,000 tons available within 50 miles of Claremont, where a Claremont MRF would be their closest option. If advanced collection options were put into place, similar to the projections for Sullivan County, 10,000 or more tons could be available.

Collection of Recyclables: Costs were estimated for curbside collection at each of the above tonnage scenarios for each of the four largest towns. Results show that for Claremont, a publicly funded curbside collection program could be implemented for around $40 per household or about $240,000 per year – for either single or dual stream. Costs per ton range from around $90 for single stream to $140 for dual stream - with higher single stream tonnage projections being the primary reason for the difference between the two. Costs for the other three towns are available in the report and in Appendix B.

Private vs. Public Collection Option: Private haulers are a viable option for developing recycling collection programs. Single hauler municipal contracting for both refuse and recycling services for all residential units in a town is one such approach. Exclusive or non-exclusive hauler franchising/licensing for both refuse and recycling collection is another approach. In both cases, the contracting arrangements allow the public agency to designate where both refuse and recycling goes and to dictate as part of the service specifications just how recycling collection must be handled (e.g. weekly dual stream).

Processing Options: The bulk of the following report, though, focuses on the processing options that Sullivan County should consider, including the potential for a county MRF. The options considered included:

- consolidate and transfer all materials to an area MRF,
- build a facility to process only commingled fiber (while transferring bottles/cans),
- build a mini-MRF, and
- build a full size MRF.

Each of these options (except the facility to process only fiber) was modeled under dual and single stream cases. For each of the facilities a breakeven tonnage is calculated.

Two different types of single and dual stream MRFs were modeled: Full-size MRFs and Mini-MRFs. The full-size MRF is typical of those in all major metropolitan areas and uses a combination of mechanical and manual separation techniques at an annual throughput of at least 15,000 to over 100,000 tons per year. The mini-MRF is a scaled down version that combines the fiber and container sort lines into one flex-sort line. The building can also be downsized down to a minimum to save costs. This type of facility can be scaled down to around 7,500 tons per year for dual stream and 10,000 tons per year for single stream.

Each of the MRF options is then analyzed at low, medium and high tonnages. The analysis including total capital cost, annual funded capital amortization, operating costs, total annual costs and material revenue. Net cost is then calculated, both on a per ton basis and on a per household per year basis.

The analysis shows that current tonnage levels (the low tonnage scenario) clearly favor construction and operation of a recycling transfer station instead of a MRF. The net cost of $31.37 per ton for transfer is much lower than the $122.89/ton cost for the Dual Stream Mini-MRF or the $150.04 for owning and operating the Single Stream Mini-MRF.

LOW TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	2,649	2,649	2,649	2,649	2,649
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$51,646	$61,871	$238,790	$335,314	$340,436
Total Annual Cost	**$132,674**	**$142,899**	**$456,835**	**$578,728**	**$650,642**
Material Revenue	$49,573	$6,361	$178,494	$253,221	$253,221
Net Cost	**$83,101**	**$136,538**	**$278,341**	**$325,507**	**$397,421**
Net Cost per HH per Year	$4.13	$6.79	$13.84	$16.18	$19.76
Net Cost per Ton	$31.37	$51.55	$105.08	$122.89	$150.04

The same holds true in the medium tonnage scenario (5,000+ tons), with recycling transfer at $12.58 net cost per ton, still much lower than the $29.03 ton cost for the Dual Stream Mini-MRF or the $57.84 for owning and operating the Single Stream Mini-MRF.

MEDIUM TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	5,283	5,316	5,283	5,283	5,316
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$84,297	$84,822	$280,913	$414,958	$420,383
Total Annual Costs	**$165,325**	**$165,850**	**$498,958**	**$658,372**	**$730,589**
Material Revenue	$98,866	$12,765	$355,980	$505,012	$423,149
Net Cost	**$66,459**	**$153,086**	**$142,978**	**$153,359**	**$307,441**
Net Cost per HH per Year	$3.30	$7.61	$7.11	$7.63	$15.29
Net Cost per Ton	$12.58	$28.80	$27.07	$29.03	$57.84

It is only in the High Tonnage scenario at over 7,000 tons, that owning and operating a dual stream MRF (at net $ .20 revenue to the County) begins to out-perform the recycling transfer options which remain relatively low at a net cost of $8.61 per ton.

HIGH TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	7,396	8,859	7,396	7,396	8,859
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$121,072	$141,439	$337,890	$462,129	$493,931
Total Annual Costs	**$202,101**	**$222,468**	**$555,934**	**$705,544**	**$804,137**
Material Revenue	$138,413	$21,275	$498,372	$707,017	$705,248
Net Cost	**$63,688**	**$201,193**	**$57,562**	**($1,474)**	**$98,889**
Net Cost per HH per Year	$3.17	$10.00	$2.86	($0.07)	$4.92
Net Cost per Ton	$8.61	$22.71	$7.78	($0.20)	$11.16

The results of the analysis will give the County the tools necessary to determine the best course of action for expanding their recycling programs in the near and long term. Following is a summary of the Key Recommendations and the next steps required to develop the project.

Key Recommendations

- In order to minimize risk to the County, recyclables should be consolidated at a recycling transfer station located, likely in Claremont. The facility can be co-located with a waste transfer station to minimize capital costs. Agreements can be negotiated with one of the area MRFs to accept the material and with the towns to deliver the material.
- During this period, negotiations should also take place with population centers in adjacent counties, working towards building a critical mass of tonnage needed to develop a dual stream mini-MRF as described below. A total of 1,500 to 3,000 additional tons should be secured from these sources.
- In order for the County to show a strong commitment to recycling, three programs are recommended to be developed over the next five years. Because of the lower tonnage, lower capital risk and history of dual stream collection at the transfer stations, a dual stream system collection and processing system is recommended.

- Develop the curbside programs in the larger towns to increase recycling diversion either through municipally run collection programs, private contracts or non-exclusive hauler licensing. An education and marketing campaign should accompany this rollout to generate interest and promote participation. Expanded recycling collection programs like these are essential to secure an additional 2,000 to 2,500 tons of recyclables needed to justify a County MRF.
- A county-wide Pay-As-You-Throw program should be developed to encourage recycling and educate the residents about the full costs of waste disposal. Again, this would be implemented through ordinance and hauler licensing requirements.
- A dual stream mini-MRF is recommended once a comfortable critical tonnage has been reached. A processing facility will solidify the County's commitment to recycling, provide a long-term stable alternative to waste disposal, encourage significant diversion from the waste stream and educate the next generation of recyclers.

SULLIVAN COUNTY RECYCLING COLLECTION AND PROCESSING OPTIONS

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I. INTRODUCTION

With the recent termination of the contract with the Wheelabrator incinerator, Sullivan County has a powerful opportunity to shape the future of solid waste for this area of New Hampshire and Vermont. In this study we have specifically looked at the opportunities for increasing residential recycling through a curbside program and locating a processing facility in Claremont, NH. In order to achieve the New Hampshire state goal of 40% waste diversion, the County will need to put in place multiple programs to increase the processing capabilities available to the towns, increase the ease with which residents can recycle and educate the public on the long-

term financial and environmental benefits of recycling. Being mostly rural, Sullivan County does not have the benefits of economies of scale available to urban areas; however, there are still multiple economically feasible choices for the County to improve their handling of solid waste.

This Study is a follow-up to the *Recycling-Based Waste Management Action Plan* by the Antioch New England Institute (ANEI) working in consultation with the Waste Action Collaborative of Sullivan County (WACSC). One of the principle recommendations of the Action Plan is the construction of a materials recovery facility (MRF) to serve the communities of Sullivan County.

In order to build a business case for a MRF for Sullivan County, three different factors must first be understood: material availability, nearby processing capacity and available end markets.

II. MATERIAL PROJECTIONS

Projections of available recyclables, broken down by material type, were developed for the collection and processing analyses outlined in this report. Previous work by Peter Engel and ANEI projected material flow available for recovery based on estimated capture rates for a percentage of the recyclable materials available from the total waste generation of the County. RRS methodology uses baseline recyclable material recovery rates per household in the County that would be expected under different collection scenarios. These recovery rates are drawn from RRS analyses of other municipal recycling programs.

The amount of material that a household sets out is dependent on a number of factors. These factors include the basic collection scheme: drop-off, rural curbside, urban curbside, etc as well as the commingling scheme: source separated, dual stream and single stream. The rule of thumb for both of these variables is, “The easier the recycling system is, the more people will use it.” Single stream curbside will generate significantly more material than a source-separated drop-off. Communities that switch from a source-separated to commingled system (drop-off or curbside) notice an increase in materials recycled. All of these schemes are also dependent on cohesive marketing and education materials that encourage people to recycle and educate them on how to do it.

Securing Additional In-County Recyclables for a Sullivan County MRF

For this report four scenarios have been analyzed: current, dual stream, dual stream pay as you throw (PAYT) and single stream PAYT. The dual stream, dual stream PAYT, and single stream PAYT all assume curbside recycling collection for the four largest towns in the county. The recovery estimates for Sullivan County are presented in the following table for each of these scenarios.

For the PAYT options, nationwide data shows recovery increases that average 5% - 15%. But areas without a strong waste management/minimization program can show significantly higher increases. Data from the Northeast Resource Recovery Association (NRRA) for one New Hampshire community showed a 40% increase. More importantly, the recyclable generation rates for three PAYT communities were higher than we otherwise would have estimated (over 800 lbs/HH/year). Therefore, for our PAYT options, we show significant increases in recovery to reflect the local trends.

SULLIVAN COUNTY RECYCLING RECOVERY ESTIMATES					
Towns	**2005 Total Recycled**	**Estimated Current MRF Tons**	**Future Dual Stream Tons**	**Future Dual Stream PAYT Tons**	**Future Single Stream PAYT Tons**
Acworth	128	90	90	125	154
Charlestown	469	328	580	812	998
Claremont	1,021	715	1,660	2,324	2,818
Cornish	116	81	126	177	270
Croydon	50	35	56	79	113
Goshen	86	60	65	91	133
Grantham	190	133	516	722	702
Langdon	70	49	49	69	84
Lempster*	139	97	97	136	177
Newport	339	237	757	1,060	1,269
Plainfield	108	76	164	229	356
Sunapee & Springfield	777	544	870	1,218	1,275
Stoddard & Washington*	216	151	151	212	301
Unity	75	53	101	141	209
TOTAL	3,784	2,649	5,283	7,396	8,859
Average MRF Material Generation Rate (lbs/HH/year)		263	525	735	881

* Detailed demographic data was not available for Lempster or Stoddard as they are not part of the North Valley / Lake Sunapee Planning District. When necessary, data was estimated from similar sized towns.

For citizens outside of the four largest towns, the transfer stations will still be the main area to recycle. For each of the scenarios, it is assumed that all of the transfer stations convert to the same type of collection scheme and deliver their tons to the MRF. Even with the addition of a county processing facility, the transfer stations will still offer the ability to recycle additional materials like bulky recyclables (i.e. refrigerators and electronics) and hard to recycle materials, such as fluorescent tubes. The transfer stations could also be expanded to accept items such as plastic bags, polystyrene and other low weight materials. As part of a grant, NRRA offered suggestions to improve each of the transfer station operations and expand their services.

Their recommendations were very well grounded and deserve strong consideration by each town, or by the county as a whole as part of a comprehensive recovery strategy that includes a strong network of recycling transfer stations as well as a MRF.

All three estimated scenarios include tonnage collected from small businesses. These estimates were based on projected recovery rates calculated in pounds per employee per year. For the larger towns recovery from these small businesses would be incorporated into the residential routes. Most of the town transfer stations are already likely receiving this material.

Securing Additional Out-of-County Recyclables for a Sullivan County MRF

There is potential for additional out-of-county recyclables being delivered to a Sullivan County MRF. Appendix A provides a map of the region showing possible sources and quantities of recyclable materials that are already or could be available.

- Competing MRFs and their Locations: There are currently no Material Recovery Facilities within 50 miles of Claremont. Within 50 miles of Claremont, there are conservatively 7,500 tons of material available outside of Sullivan County. Within 50 miles of Claremont where a Claremont MRF would be the closest option, there are conservatively 5,000 tons

of material available outside of Sullivan County. These two estimates are based on low pounds per household generation rates (250 lbs/HH). If these towns either have developed programs or improve them, the available material could easily double.

- Most towns in the area collect material as a mix of dual stream and source separation. Single stream collection is attractive to towns considering curbside and is likely to bring in more material than dual stream. Generation rates for single stream are also significantly higher than other programs and could increase the available material three-fold.
- Many larger towns (e.g. Lebanon, NH and Hartford, VT) have basic processing in place (i.e. vertical balers) and receive revenue from the material. They may be unwilling to abandon their programs in favor of Dual or Single Stream MRF unless they receive some form of revenue share from a MRF.
- Revenue share options can vary greatly even at the same facility. In order to minimize risk in volatile markets, MRF owners/operators set up tip fee/revenue share over a trigger price arrangements. The tip fee and trigger price protect the facility from losing money in slow markets, while sharing revenue during strong markets. See Table in Section III for Current Arrangements for area MRFS.
- If a deal similar to the City of Keene MRF were offered (35% of Yellow Sheet or approx. $20 - $25 for mixed paper), it is likely that a Sullivan County MRF in Claremont would attract nearly all of the in-County tons and other towns that do not process their own material.
- However, for the towns that currently bale their material and collect source-separated, it is difficult to predict whether they will be interested in modifying their collection system, and reducing their own staffing.
- Where possible preliminary negotiations should be undertaken and if possible sign a memorandum of understanding stating they will send their material once a MRF is built

III: MATERIAL MARKETS

Currently the markets for Sullivan County materials are the area MRFs. There are in effect five MRFs within hauling distance of Claremont. Each of them was contacted to determine what type of deal they might offer if Sullivan County consolidated their tons and sent them by transfer trailer in either dual or single stream. The potential deals are summarized in the following table.

Name	Distance (mi)	Est Drive Time (hrs)	Est. Haul Cost (per Ton)	Single Stream Revenue Share (per Ton)	Fiber Revenue Share (per Ton)	Container Revenue Share (per Ton)
Chittenden Solid Waste District	110	2.5	$17.00	($5)	-	-
Rutland County	49	2	$16.00	-	$5 - $10	$5 - $10
Windham County	47	1.5	$15.00	-	($25)	($25)
City of Keene	40	1.5	$14.75	-	$25	$0
Corcoran (Possible Future)	70	2	$16.50	$2.40	-	-

If a MRF is built, the County would be able to market their material nationally and internationally. Based on current market indices for the Northeast US, the following prices have been used throughout the analysis. These prices are for a full truck load (usually around 48-52 bales) of the material picked up at the facility. Due to the lack of glass furnaces in the area, the glass is assumed to be marketed as a processed glass aggregate (PGA).

Current State of Recycling Markets

- *Markets for all recycled material have steadily increased over the last 5+ years unlike prior periods that were characterized by more price fluctuations.*
- *The changes that have caused the price increases are long term trends and unlikely to be reversed. They include: increased cost of oil (drives up plastics prices), increased demand from China and India for all post-consumer products (notably paper, metal and plastics), increases in demand for recycled products due to awareness of global warming and other environmental impacts*
- *Some significant emerging materials are film plastics, mixed rigid plastics and injection molded plastics, with market demand driven by the factors outlined above*
- *Strong demand has resulted in more flexible specifications for the baled product, requiring less processing and allowing more grade commingling than in the past.*
- *Recyclable commodities have always been a global resource. Worldwide markets now drive pricing and demand.*
- *Local MRFs can now access these world markets and secure favorable terms, pricing and arrangements even when regional paper mills push for lower pricing and tougher grade specifications.*

Material	2nd quarter 2007 Sale Price (per Ton)
SWL (#40)	$ 237.50
SOP (#37)	$ 142.50
ONP (#8)	$ 95.00
ONP (#6)	$ 47.50
OCC	$ 85.50
Residental Mix/MP (#1)	$ 61.75
Tin/Steel	$ 120.00
Aluminum	$ 1,400.00
Glass-Clear	$ (10.00)
Glass-Green	$ (10.00)
Glass-Amber	$ (10.00)
PETE	$ 300.00
HDPE-Clear	$ 550.00
HDPE-Colored	$ 300.00
Residue	$ (90.00)

As awareness increases about global warming and the effects of industry on the environment, the environmental benefits of recycling are becoming more valuable. For individual citizens one of the single most important actions they can take to reduce their carbon footprint is to recycle (estimated at 1000 lbs of CO_2 Equivalent per capita). The environmental benefits of doubling the material recycled by Sullivan County are summarized in the table below. The water saved is

equal to the amount used by 291 Americans throughout the year. The energy saved could power 4,310 houses for one month. The greenhouse gas (GHG) emissions saved is equal to taking over 1,200 cars off the road for one year.

Environmental Benefits of Doubling Recycling in Sullivan County		
Total Water Saved	16,148,375	Gallons
Total Energy Saved	12,315,030	kWh
Total GHG Emissions Saved	7,043	Metric Tons CO_2 Equivalent
Total Landfill Volume Saved	5,848	Cubic Yards
Total Trees Saved (from paper products)	37,518	Trees

IV: RECYCLING COLLECTION OPTIONS

In order to achieve the goal of 40% waste diversion and achieve enough tons in the County to make a MRF viable, one of the most important aspects of the program must be curbside collection. It is a highly visible, "high customer satisfaction" service – impacting daily life, integrating the weekly curbside recyclable set-out task and cultivating a community culture that supports managing our waste streams with environmental responsibility.

In Sullivan County, there is currently only one town (Plainfield) that financially supports a curbside collection program. Expanding this collection to the four towns that have more than 2000 households could significantly increase the diversion of solid waste. For this analysis curbside collection costs were modeled separately for Claremont, Newport, Charlestown, and Sunapee.

The broad "rule of thumb" is to make recycling as convenient as trash collection – reducing the physical barriers to the choice to recycle. Towards that end – recycling programs have been evolving over the last twenty years from a historical reliance on "source separation" towards systems that allow more commingling – with the emergence of "single stream" recycling representing the most significant development in this progression.

Recycling collection program design is the key to achieving this convenience and is measured in this analysis based on these goals:

- Maximize recycling diversion (measured in pounds per household)
- Increase user friendliness (measured by in-home logistics/space/usage requirements)
- Improve affordability and cost effectiveness (measured in cost per household)
- Maximize capital utilization (measured in total capital requirements and return on investment)

IV-A: ANALYSIS OF RECYCLING COLLECTION SYSTEMS

In order to estimate the collection costs for each of the four largest towns, a simple model was setup to estimate the number of routes required to service all of the households in the town. This calculation is based on average pounds per curb-hour for urban/suburban and rural recycling routes that we have analyzed for other clients. Once the number of routes has been determined, the capital and operating costs are calculated using the number of trucks, drivers, and recycling bins along with estimates for overhead, fuel and maintenance. All of these calculations produce a total capital, total yearly operating cost and cost per ton for each town.

Three options are evaluated for each of the four towns:

- Dual Stream: Residents would receive two 18 gallon curbside recycling bins, one for commingled bottles/cans and the other for commingled paper. High capacity two compartment compacting recycling trucks would be used to collect the recyclables at the curb once each week - on the same day as refuse pickup if possible to further increase convenience. Refuse collection would continue as is, however the communities may want to consider hauler licensing to establish days of collection for refuse so that recycling and trash can be collected on the same day. Other materials, such as injection molded plastics, would be added at a later time should markets be available through the MRF. Curbside collection of plastic film in plastic bags, an emerging practice in some west coast communities, could also be added should the MRF be designed with the up-front capacity for capture of these bags.
- Dual Stream with PAYT: The Dual Stream package described above would be implemented in conjunction with a modification to refuse collection to include a pay as you throw system – some combination of set-out limits and a variable rate fee system like bag/tag or unit based pricing per container.
- Single Stream with PAYT: Residents would receive their choice of a 64 or 96 gallon wheeled "curb-cart" container to place all their single stream of commingled bottles/cans and paper. High capacity conventional single compartment compacting trucks equipped with cart lifters would be used to collect the recyclables at the curb once each week on the same day as refuse pickup (as described in the Dual Stream program). Refuse collection would continue as is. Other materials, such as injection molded plastics, plastic film, etc. would be added should markets be available through the MRF. Conventional bins could be used by some households if needed.

For all three systems it is assumed that the trucks are fitted to allow the pickup of curb-carts from multifamily complexes and small businesses. Even though single family households would receive a recycle bin, the businesses and multi-family complexes could receive a curb-cart. In this analysis, the cost for curb carts is not included in the dual stream model with those generators purchasing or renting these carts on their own. The cost for curb carts is included in the single stream model.

Analysis-Performance and Cost Projections: The results of the modeling effort show that for Claremont, a publicly funded curbside collection program could be implemented for around $40 per household or about $240,000 per year. This holds true for single or dual stream. The cost per ton ranges from around $90 for single stream to $140 for dual stream. The capital investment for either option is around $550,000 for dual stream and $660,000 for single stream. In general, single stream is cheaper to collect because of decreased truck costs and faster pickups, but this is somewhat offset by higher costs for curb-carts for each household. For Claremont, the cost of the curb-carts outweighs the lower costs of trucks and the efficiencies in collection were not enough to reduce the number of trucks. For Newport, the results were similar, but due to the high costs of capital and the smaller population, the cost is estimated at around $50 per household or $140,000 per year. This works out to $110 per ton for single stream and between $130 and $180 for dual stream depending on tonnage. The estimated capital for this service is between $320,000 and $360,000.

For the two more rural towns, distance between houses significantly reduces the speed of collection and thus increases costs. However, the efficiency of single stream does result in fewer trucks for each town. For Sunapee and Charlestown, the dual stream collection is estimated between $65 and $110 per household (the higher tonnage modeled required the purchase of a new truck), whereas for single stream the price was $65 per household for all tonnages modeled. The yearly operating costs are estimated between $140,000 and $230,000

for each town. The per ton costs for the rural towns range from $130 for single stream to $290 for dual stream.

The per ton estimates are significantly higher than what was reported previously in the analysis by Peter Engel. This appears to be because capital replacement costs are included in this analysis as operating costs. This assumes that each year money is set aside for equipment so that at the end of its usable life, money is available in a fund to purchase new equipment.

Included in Appendix B are detailed charts showing the estimated number of routes, labor costs, operating and maintenance (O&M) costs, along with the capital estimates.

IV-B: PERFORMANCE ENHANCEMENTS FOR RECYCLING COLLECTION

Following are the major performance enhancements for recycling collection that deserve consideration in Sullivan County's recycling plans.

Moving Towards Commingling – Either Dual Stream or Single Stream Recycling: Many of the towns currently collect materials dual stream at the transfer stations, however, many others collect source separated to ease their material processing and market preparation requirements. Allowing more commingling of recyclables, both in the home and at the curb, has tremendous efficiency and diversion impacts.

Dual stream recycling with two 18-gallon curbside recycling bins has been the most common curbside recycling method for the last two decades. For the household it requires a smaller footprint in the garage or utility room and a relatively easy transport of the materials to the curb. Curbside collection is also much easier than the curbside source separation recycling programs that require the driver to undertake time consuming "curb-sort" tasks, often averaging 45 to 60 seconds per household stop. Dual stream recycling is much faster with the recycling collection worker required to make two very simple lift moves – often cutting the at curb time down to less than 25 seconds per stop - significantly reducing collection costs. As well dual stream recycling facilities have proven performance that enables cost effective sorting and marketing of the recyclables with low residue rates.

The move to single-stream recycling is the most significant development in recycling in the last decade. The wheeled 64 or 96-gallon curb-cart further simplifies in-home recycling practice and greatly increases the ease in moving large quantities of recyclables to the curb. Conventional, and less costly, single compartment compacting collection trucks can then be equipped with automated or semi-automated lift systems, greatly reducing collection worker injuries and allowing longer collection shifts as weight based work rules are eliminated, further lowering costs. At the single-stream MRF, “disc screens” separate bottles and cans from the paper stream, essentially an upstream "front-end" addition to a dual stream MRF. The newer single stream MRFs, with the later generation disc screen systems, have been able to achieve ever-lower residue rates (8% to 12%) and greatly reduce cross contamination of paper by other recyclables.

An added benefit of dual and single stream systems is the ease of reaching outside the traditional single family residential curbside base by enabling much simpler lower cost service of multi-family complexes as well as many small businesses and institutions that require residential type services. Next generation curbside recycling vehicles are equipped to service curb-cart customers on the same route (multi-family and small businesses) and represent a very easy method for increasing diversion and overall recycling access. Dual and single stream processing systems are the key to making this more flexible collection

capacity possible. For this analysis we will examine both dual stream and single stream collection service offered on a weekly basis.

High Capacity Compacting Recycling Trucks: Moving towards greater commingling greatly increases collection efficiency for recycling, allowing greater payloads per truck trip. The ability to compact recyclables in high capacity recycling trucks is the single greatest efficiency improvement that dual and single stream recycling programs can strive to achieve, allowing significantly more households to be serviced on each route as payloads reach 6 to 8 tons per collection vehicle compared to 3 or fewer tons for many programs that collect with greater degrees of source separation and curbside sorting. Compacting is possible with a dual stream program but is most common with single stream recycling programs.

Automated Collection: Single stream recycling has also allowed collection programs to convert to automated collection, further increasing the efficiency at the curb, with the at curb service time per stop able to be further reduced to less than 15 seconds. This significantly more worker friendly job has allowed single person recycling trucks to operate in longer shifts with some programs set up with four day collection and ten hour shifts, often servicing as many as 1200 to 1400 homes per route. These developments, made possible only by the emergence of single stream recycling, enable the most cost effective recycling collection possible on a cost per service unit (household) and cost per ton basis. There are disadvantages, though, as opportunities for worker inspection of material decrease, placing even greater demands on the citizen education program to push for compliance and on the MRF to handle the prohibited materials that will be picked up. Camera systems allow a worker to see likely contaminants, in order to allow an "oops" card to be left with the household, but the material will already be in the collection truck at that point.

Adding Additional Materials to Recycling Collection Programs: Higher recycling recovery rates per household or business unit are directly correlated to the range of materials that are accepted in the recycling collection programs. In general the phrase "more is better" is justified - within reason. Some of the benefit is very rational, with materials like corrugated cardboard, office paper, paperboard and the like representing large fractions of the waste stream and their addition logically meaning that more will be diverted by participating generators. But additional benefit apparently comes from the difficult to measure behavioral response that research indicates is triggered by adding materials – i.e., the generator perceives the recycling program as being more useful and more valuable, and thus uses it more. As an example, the "all plastic bottles" approach reduces psychological barriers to recycling by making it simpler and more automatic - generally viewed by behaviorists as the key to reaching consistent and ongoing practice. Finally, the longer list of materials and the simpler instructions that can then follow ("if it tears…") tend to make recycling very mainstream – resulting in more generators choosing to begin recycling - all of which raises the overall recycling diversion rate.

For this analysis we will assume that residential recycling collection systems, unless otherwise noted, include for Commingled Fibers: old newspapers (ONP), old corrugated cardboard (OCC) including pizza boxes, old magazines (OMG), residential mail, office paper, kraft paper bags, box board (cereal boxes, beverage cartons), phone books, gift wrapping paper and shredded office paper and for Commingled Containers: all closed mouth plastic containers, aluminum cans, other aluminum, tin cans, steel cans, other household scrap metal, green glass, amber glass, clear glass, milk cartons and drink boxes. Certain marginally significant materials due to their low volume by weight (e.g. plastic film and injected molded plastics like butter tubs) are not included in this analysis but can be accommodated by the collection systems once suitable processing capacity is in place locally.

Adding Additional Container Capacity: A key variable in recycling participation is the container system that is provided. Again, the "more is better" approach serves as a guideline. There are programs, for example, that offer no containers for the generators - with the expected dismal diversion rates. And programs that offer two or more 14-18 gallon curbside recycling bins generally show higher diversion. The addition of wheeled carts (64 to 96 gallons in capacity), primarily driven by single stream recycling programs, has provided more evidence that additional container capacity causes increased diversion and participation. Some studies have isolated container capacity from single stream systems to show that total gallons of container capacity and the ease of moving it (wheeled carts) is as much a driver of higher diversion as the single stream capability. This research would indicate that other methods of improved portability, such as offering a wheeled caddy for the curbside recycling bins, would also increase participation and diversion.

For this analysis, we will assume that recycling programs need sufficient container capacity (both size of container and frequency of pickup) to accommodate high levels of recycling diversion. Dual stream curbside programs are evaluated with two 18-gallon curbside recycling bins provided to each household and single stream curbside programs are evaluated with one recycling curb-cart per household (either 64 or 96 gallon depending on generator).

Adding incentive systems like Pay as you Throw (PAYT:

Incentives systems are the "energy boost" of recycling collection systems, making a great recycling program better and often overcoming some of the deficiencies of a poor recycling program. PAYT or **"Pay As You Throw"** is exactly what it sounds like – those that put out more trash should pay more and those that put out less trash due to recycling and waste reduction should pay less. PAYT programs, along with can limits at the curb, have been shown to provide an incentive for reuse and waste reduction. Note that PAYT works best when adjacent communities adopt it as a whole, preventing cross jurisdiction illegal dumping.

Considerations for Each of the Three Options:

User Friendliness: The chart below evaluates the overall user-friendliness of each of the options on a 100 points scale with breakouts for in-home footprint, total container capacity, ease of transportation to and from the curb, simplicity of instruction and education/motivation boost. Breaking user friendliness down in this way helps underscore the impact that program design features have for the homeowner and their inclination to participate. Fundamentally, if any service is going to be provided, especially one that requires self-motivated user behavior, it pays to have it be as customer friendly as possible.

As the chart shows, the single stream option out-performs dual stream in the home (80 out of 100 versus 53) based on total container capacity, ease of transportation to and from the curb and simplicity of instruction. Tweaking the dual stream program, for example, by providing an option for a wheeled caddy to carry bins to the curb, would increase user friendliness and thus participation in the dual stream system.

URBAN CURBSIDE	Maximum Points	Dual Stream	DS PAYT	Single Stream
Total Value of User Friendliness Features	**100**	**53**	**55**	**80**
In-Home Footprint	15	10	10	10
Total Container Capacity	15	8	8	15
Ease of Transport to/from Curb	30	15	15	30
Simplicity of Instruction	20	10	10	15
Education/Motivation Boost	20	10	12	10

Cost per Household and Capital Utilization: The charts in Appendix B show cost per household and per ton for each of the three collection options, including capital requirements and total operating costs for each of the four towns. These charts, provided for each of the towns that would most benefit from curbside collection options, incorporate a number of items worth noting:

- Capital requirements assume all equipment needs to be purchased. Only backup trucks are used vehicles.[1]
- The model uses "funded depreciation" of capital in operating cost calculations. This means that the capital replacement cost is part of operating costs.[2]
- For Claremont and Newport, the collection assumptions (i.e. pounds collected per work hour) are closer to conventional urban/suburban curbside recycling performance whereas Sunapee and Charlestown are akin to rural collection. This is evident in the number of routes required to service the same number of households. Rural routes have significantly longer distances between pickups than an urban route, thus reducing the amount of material that a driver can collect in one shift.
- Single Stream routes can collect about 50% more per route due to the automatic cart lifter and single pickup for each house. Unfortunately, for the two larger towns, the efficiency did not result in fewer truck purchases. A more detailed analysis may change allow a reduction in truck purchases.
- Fuel costs, while significant, are not as dominant as labor and vehicle costs. A 25 cent increase in fuel is less than a 1 percent increase in total costs.

Key Features and Risks: Key features and risks associated with these scenarios include:

- Instituting a public sector curbside collection program offers benefits of jointly servicing all the towns but will encounter significant challenges when the solid waste is picked up by private contractors. The most apparent is the difficulty in coordinating days of collection. Research has shown that collecting recycling on a different day than waste will significantly lower the participation and generation rates. The towns could institute a hauler licensing system (a form of non-exclusive hauler franchise) that would specify days of collection as part of the hauler licensing requirements that would then allow the town's recycling collection service to be same say as trash collection.
- In place of public sector collection for recycling (or waste), a franchise hauler could be chosen by each town (or by the County) that would be responsible for recycling and waste collection, or non-exclusive hauler franchise/licensing arrangements could be put in place either at the town or county level. These approaches allow critical service requirements to be specified as part of the hauler procurement process (e.g. day of

[1] Note, that we assume high efficiency equipment for this collection cost analysis (total truck capacity, compacting capability, low right hand drive, quick cycle times for any cart lifters, etc.).
[2] For the trucks a 7 year life and 5% depreciation are used.

service, type of collection scheme, missed pickup coordination, etc.) and leverages the private sector capacity to finance capital requirements (trucks, carts, etc.) by offering a long term arrangements (e.g. 5 plus years) to reduce their financial risk. These approaches have the added advantage of allowing the public agencies to direct their recyclables (and their waste) to specifically designated recycling processing and waste transfer/disposal facilities.

- The single stream option offers the lowest operating cost per ton, but in most cases requires the largest amount of up front capital due to curb-cart purchase costs. The higher capital costs and the higher volume of material that is anticipated increase the cost per household for this option. Public sector operation will require capitalization of both trucks and containers. Privately contracted operation will require a longer term contract in order to amortize container purchases and still be cost competitive for the County. Diversion under the single stream option is strong, at 6,152 projected tons or almost 70% of the projected tonnage for the entire County.
- The dual stream recycling collection options are more economical on a per household basis, because the recycle bins are much less expensive than the curb-carts for each household. In this case the curb-carts outweigh the increase in cost for specialized recycle trucks. Diversion will not be as strong with a dual stream collection system as with a single stream.

V: RECYCLING PROCESSING OPTIONS

The largest constraint on accessing these recycling collection performance enhancements is processing capacity – or the lack thereof. The processing infrastructure that the County could put in place will either make it possible to reach targeted recycling performance goals or continue to serve as the major barrier to reaching those goals. Recycling processing choices are the critical path challenge for Sullivan County. These choices include:

- Transferring recyclables to other MRFs in the region
- Process certain materials at a County owned and operated facility
- Owning and operating a full-scale or mini-MRF

V-A: ANALYSIS OF RECYCLING PROCESSING OPTIONS

Before looking at the cost to build and operate a MRF, a study of the available MRFs in the area is needed to see the available options for the material. Sullivan County is in a unique position in that there are already MRFs serving most of the larger population centers that may otherwise be able to provide material for the MRF; however, they are sufficiently far away that the economics of hauling to them are less than ideal. There are two important considerations for the local marketplace for recycling services:

- There are a number of single and dual stream MRFs in the region that could provide cost effective services for the County, and
- Sullivan County currently does not have management control of the flow of recyclables in the County which could limit the ability to guarantee feedstock for a recycling facility.

The following analysis will provide insight into the performance and cost parameters that must be considered as the County looks at its options.

VA-1: Transferring Recyclables to MRFs in the Region
The deals that the MRFs would potentially offer Sullivan County are summarized in Section III.

Analysis-Performance and Cost Projections: In order to better understand the economics of transferring recyclables to a nearby MRF, a capital and operating cost model was developed for building a basic transfer station, purchasing necessary equipment and transferring recyclables to 120-cy transfer trailers.

It is important to note, that normally two of the principal reasons for consolidating the material and shipping in large trucks is to reduce hauling costs and to negotiate a better deal from the MRF. Since many of the towns already market material through NRRA and ship to the Keene MRF, it is unlikely that the County would receive a better deal than the individual towns currently do. In this case, the primary reason for consolidating the towns' material is to begin to amass the critical tonnage necessary for a MRF, before investing the significant capital to build it. The analysis is based on transferring dual stream materials to the Keene MRF from Claremont. The single stream MRF is assumed to be the planned facility in Concord, NH proposed to be built by Corcoran Environmental. The analysis assumes that all materials have been delivered to the facility - no costs were modeled to get the material to Claremont from the towns. However, for the majority of the towns (and material) the proposed Claremont facility will be closer than their current haul.

TRANSFER MATERIAL TO AREA MRF				
	Dual Stream Current	**Dual Stream Predicted**	**Dual Stream PAYT**	**Single Stream**
Fiber Tonnage	2,023	4,035	5,650	6,644
Container Tonnage	625	1,247	1,746	2,215
Total Tonnage	**2,649**	**5,283**	**7,396**	**8,859**
Capital				
Building @ 6,000 sf	$334,375	$334,375	$334,375	$334,375
Trucks & Loader	$326,000	$326,000	$326,000	$326,000
Total	**$660,375**	**$660,375**	**$660,375**	**$660,375**
Operating				
Number of Transfer Trips per Year	161	322	451	492
Annual Loading Costs	$21,326	$42,652	$53,315	$63,101
Annual Transfer Costs	$30,320	$41,645	$67,757	$78,338
Annual Capital Depreciation	$81,028	$81,028	$81,028	$81,028
Total Annual Cost	**$132,674**	**$165,325**	**$202,101**	**$222,468**
Material Revenue	$49,573	$98,866	$138,413	$21,275
Net Cost / (Revenue)	**$83,101**	**$66,459**	**$63,688**	**$201,193**
Net Operating Cost per HH per Year	$4.13	$3.30	$3.17	$10.00
Net Operating Cost per Ton	$31.37	$12.58	$8.61	$22.71

- Dual stream: 35% of Yellow Sheet for Mixed Fiber assumed to be $70, no cost no revenue for containers
- Single stream: $5 tip fee, 25% revenue share above $50 trigger point, average sale price: $79.61

If the County was able to keep the revenue from the material the program could be run for around $80,000 per year, assuming the material was transferred dual stream. However, since the towns are currently receiving revenue from the sale of their materials, they will likely want some revenue in return for their material. If the material revenue is passed directly back to the towns, the County could run this program for $130,000 to $160,000 per year (including capital

replacement[3]) until sufficient tonnage was amassed to justify a MRF. If this operation was located at an existing waste transfer station, then it could be run for $80,000 to $110,000 per year (including capital replacement for trucks).

For a detailed understanding of the capital and operating assumptions for the cost model, see Appendix B.

These costs may increase or decrease in the following ways:

- Hauling the material by tandem roll-off truck (80-cy total) will increase the transfer costs by at least 35%. The higher tonnages will increase more because a second driver will need to be added. However, existing vehicles may be used, lowering capital costs by $200,000.
- Overall, fuel costs do not significantly affect the cost per ton. For example, a $0.25 increase in fuel price only increases the cost per ton by 1%.[4]

Key Findings

Advantages: Key advantages of these processing options include:

- Relatively low capital investment.
- Consolidates material at single County Facility

Disadvantages: Key disadvantages of these processing options include:

- Does not capture value of materials
- Capital costs still incurred to construct transfer pad
- Cost per ton does not decrease significantly as tonnage increases
- Operating costs are susceptible to increases in gas prices
- Hauling single stream will likely result in lower revenue sharing
- Adding materials is constrained by what the destination MRF will process
- Hauling loose materials long distances increases net truck emissions

Key Variables and Risks:

- Transferring materials will allow the county to consolidate materials without investing in the infrastructure necessary for processing. If tonnage increases to necessary levels a MRF or other processing facility could be built at that time. Material could be consolidated from the larger towns or towns north and west of Claremont, especially as they begin to implement curbside programs. This would avoid increased hauling distances for the material.
- Currently the Keene MRF is not setup to handle large loads of containers. Their current setup does not have a tip floor, but instead a 17-cy hopper. Modifications would have to be made in order to accept transfer trailer loads. The City of Keene would likely need a long-term contract in order to make the investment worthwhile.
- The Corcoran MRF in Concord is not yet constructed and the processing capabilities and residue rates are unknown. Corcoran Environmental does not have significant

[3] The analysis here assumes a basic 6,000 sf transfer station (Coverall fabric or pole barn) is built on County land, amortized over 20 years at 5%. Also a loader and transfer trailer would be purchased and amortized over 7 years.
[4] Fuel costs are calculated only for the driving time, no idling time is included.

experience in constructing and operating MRFs and may not have a top quality facility. However, they did indicate a willingness to construct a transfer station (or two) with a long-term contract from the County to send their material to the MRF. This would allow the County to significantly reduce their capital investment for the transfer option.

VA-2: Processing Fiber Only

Another intermediary step that the County could consider before building a MRF is a facility that could process mixed fiber, and transfer mixed containers to a nearby facility. Capital costs can be saved on the building and the equipment by not processing containers.

Analysis-Performance and Cost Projections: For this analysis, a 12,000 sq.ft. building[5] located in Claremont was used to house the processing and transfer operation. A basic sort line[6] and large 2-ram horizontal baler[7] is included to sort and bale loads of mixed fiber. The containers are transferred to the Keene MRF using transfer trailers. See the detailed proforma in Appendix B for information an operating assumptions.

The results show that processing fiber and transferring containers produces the most favorable results at higher tonnages, beginning to outperform the all-transfer option. However, as an introductory option, the capital is too high at current tonnage levels to justify building the facility. As will be seen later, a mini-MRF can be built for not much more capital and all of the material will generate revenue. When facility capital amortization is not included this approach will break even at approximately 3,800 tons per year and breaks even at 8,500 tons when facility capital amortization is included.

Key Findings

Advantages: Key advantages of this processing option include:

- Significantly smaller space requirement than full MRF
- Fiber has greater tonnage and high value
- Revenue from fiber offsets container hauling costs
- Reduces capital and operational costs by not processing containers
- Could be designed to allow future expansion to process containers also
- Could be combined with Super-Drop-off to reduce capital cost and increase range of materials accepted, additional revenues and overall lowering the cost per ton

Disadvantages: Key disadvantages of this processing option include:

- Adding container processing later will be expensive
- Baler cost not spread out over container line resulting in higher unit costs
- Facility loses money at all tonnages modeled

[5] Pole-barn or Coverall type building, a small office with restrooms is included

[6] Fiber line includes: in-ground, incline and sort line conveyors, bunkers to store each material (bunker block, push through bunkers) sized to store 2 bales of the least dense material, wheel loader, fork lift and skid steer.

[7] The Harris Badger 2-ram baler was used in the throughput and bale size calculations. Although a 2-ram baler is not necessary for baling fiber, the extra power will give better OCC bales and the opportunity to process materials such as source separated mixed rigid plastics, polystyrene and others. Switching to a single ram horizontal baler could save $50,000 in capital costs.

PROCESS FIBER ONLY	Dual Stream Current	Dual Stream Predicted	Dual Stream PAYT
Fiber Tonnage	2,023	4,035	5,650
Container Tonnage	625	1,247	1,746
Total Tonnage	**2,649**	**5,283**	**7,396**
Capital			
Building @ 12,000 sf	$942,500	$942,500	$942,500
Separation & Baling Equipment	$637,520	$637,520	$637,520
Trucks & Loader	$400,100	$400,100	$400,100
Total	**$1,980,120**	**$1,980,120**	**$1,980,120**
Operating			
Number of Employees	5	5	6
Annual Transfer Costs (Total)	$15,702	$29,665	$37,980
Annual MRF Labor Cost (incl Fringes)	$174,753	$174,753	$202,417
Annual MRF O&M Costs	$48,335	$76,495	$97,492
Annual Capital Depreciation	$218,045	$218,045	$218,045
Total Annual Costs	**$456,835**	**$498,958**	**$555,934**
Material Revenue	$178,494	$355,980	$498,372
Net Cost / (Revenue)	**$278,341**	**$142,978**	**$57,562**
Net Operating Cost per HH per Year	$13.84	$7.11	$2.86
Net Operating Cost per Ton	$105.08	$27.07	$7.78
Revenue Share with Towns @ $25 per Fiber Ton	$50,585	$100,884	$141,238
Net Cost / (Revenue)	**$328,925**	**$243,862**	**$198,800**
Net Cost per HH	$16.35	$12.13	$9.88
Net Operating Cost per Ton	$124.18	$46.16	$26.88

Key Variables and Risks:

- Although often an entry step for a municipality into the commingled processing arena, allowing lower capital investment and the opportunity to expand, for Sullivan County the benefits are not readily apparent. The capital investment is two high for the current tonnages and this facility will breakeven at a similar point to the mini-MRFs described later.
- The process fiber only facility could be an entry step into the processing arena and allow the county to process a wide variety of source-separated materials as well. The revenue from the source separated material such as office paper, mixed plastics, and plastic film could help to offset facility costs. However, at low volumes the fixed operating costs outweigh the material revenue and the facility will be losing money on a yearly basis. At low tonnage (and considering the limitations of the Keene facility), the County could transfer the containers in tandem rolloffs reducing the capital costs.

VA-3: Owning and Operating a MRF

The County may be able to achieve a critical mass recycling tonnage to justify its own MRF. The following analysis will show it will likely not be a full scale MRF with separate sort lines for containers and fiber, but instead a low-capital flexible facility that can allow expansions as the success of the program grows.

Full Scale MRF vs. Mini-MRF: There are a few relatively standard designs for full-scale MRFs that are seen in all major metropolitan areas of the country. For a dual stream MRF, there are two tip areas to store loose commingled material. This material is then fed into in-floor feed conveyors, which take the material up an incline where a combination of mechanical and manual separation sorts the material into the accepted grades. A full scale container line will usually contain some type of density separation to split glass from plastics and metal, the metal is then pulled out with a magnet, the plastics are sorted by hand and the aluminum is pulled out with an eddy current. On a separate sort line the glass can then either by sorted or simply lumped together as a mixed glass product. The fiber line will normally be all manual separation of grades. The storage bins for both containers and paper will directly feed a conveyor to the baler. A full-scale single stream MRF will add a series of disc screens up front to separate the fiber from the containers. The balance of the system is basically the same. Some of the nuances and new technology are explained later in the Performance Enhancements section. These systems can be built to handle anywhere from 15,000 tons per year to over 100,000 tons per year and are housed in buildings that are at least 25,000 sq.ft.

The mini-MRF is a concept that is seen throughout the US, often in more rural areas, but also by small private hauling firms that process their own material to compete with the large hauling corporations. In general, creativity, more labor and less material can allow a significant scale down of the building and equipment. Reducing the building size to around 15,000 sq.ft. will save significant amounts of money. One of the biggest equipment cost savings is to use one flex-sort line that can accommodate either paper or containers. Commingled containers and fiber are often fed from opposite sides of the in-floor feed conveyor. Chutes can then direct the separated containers to bins on the other side of the baler feed conveyor or bins on wheels can placed under the sort line for containers. Another cost-saving opportunity is to market the plastics as a mix of grades, rather than separated. Depending on local markets, this could be more cost effective. Two case-studies are included here to illustrate the opportunity. One is a dual stream public operation and the other is a single stream private hauler.

TENNIS RECYCLING, ST. PAUL, MN

- *Collects materials curbside and processes at own facility*
- *Building: 12,000 sq. ft pole barn*
- *Throughput: 13,500 tons per year*
- *Due to competition from large haulers such as BFI and Waste Management, converted to single stream in 2005*
- *Saw a 25% increase in total recyclables after switch to single stream*
- *Two Bulk Handling Systems screens were installed to separate containers from paper*
- *Collection trucks do not use compaction in order to minimize glass breakage*
- *OCC is pulled out on tip floor and thrown directly in baler*
- *ONP and Mixed Paper are separated with a Newscreen and directly baled*
- *Containers sort line has a magnet and eddy current, glass is hand separated, and plastics are marketed as mixed #1-7 containers*

EMMET COUNTY, MICHIGAN

- *Located in Northern Michigan*
- *Population – 31,437 with a density of 68 people per square mile*
- *Operates a modified source separation collection for rural and urban areas*
- *Operates a transfer station and MRF on the same*
- *Estimated Waste: 19,000 tons/year*
- *Estimated Recycling: 6,800 tons/year*
- *MRF buildings total: 16,200 sq. ft. between three buildings (originally 11,200 sq.ft)*
- *MRF has expanded multiple times as success has grown program, additional 3,000 sq. ft will be finished this summer for bale storage*
- *Sort Line is used for Fiber and Containers with chutes to the container bunkers*
- *Container processing has magnet (metals are collected separate from containers)*
- *Revenue from waste transfer helps to cover MRF costs and program growth*

Analysis-Performance and Cost Projections: First a capital and operating model was developed for the full-scale dual and single stream MRFs. These included all of the mechanical separation equipment mentioned above. For a more detailed look at the equipment and operating assumptions, see Appendix B.

As in the other cost models, capital replacement is included as an annual operating cost. In place of building a new facility, leasing was also researched. Lease prices of $4 - $5 per square foot were located in the Claremont area. This option could potentially save the County $40,000 per year if the right location and building were found. As can be seen in the following chart, the capital cost of a full scale MRF ranges from $4.4 million for a dual stream to $5.9 million for a single stream. These costs are quite similar to the high-side cost estimates from the Action Plan. As tonnage increases, the operating cost per ton decreases significantly. Break even for the dual stream full-sized MRF occurs at 11,600 tons if no revenue share agreement is in place. If the $25 per fiber ton is paid for the material, the facility does not break even until over 16,000 tons.

The results show that a full-size MRF is likely not feasible for the County at this time when compared to the full transfer and partial transfer options. An analysis of the surrounding communities (see Attachment A) shows that it would be difficult for the County to attract enough material to reach the break-even point required to make a full size MRF financially viable.

FULL MRF COMPARISON	Dual Stream Current	Dual Stream Predicted	Dual Stream PAYT	Single Stream
Fiber Tonnage	1,957	3,903	5,855	6,201
Container Tonnage	559	1,115	1,673	1,772
Residue	132	264	396	886
Total Tonnage	**2,649**	**5,283**	7,924	**8,859**
Capital				
Building size (sf)	25,000	25,000	25,000	30,000
Building	$2,704,000	$2,704,000	$2,704,000	$2,899,000
Separation & Baling Equipment	$1,406,923	$1,406,923	$1,406,923	$2,745,056
Rolling Stock (Loader, etc)	$245,520	$245,520	$245,520	$245,520
Total	**$4,356,443**	**$4,356,443**	**$4,356,443**	**$5,919,576**
Operating				
Number of Employees	7	10	10	10
Annual Labor Cost (incl Fringes)	$264,661	$360,822	$360,822	$360,822
Annual O&M Costs	$116,024	$154,387	$178,481	$194,635
Annual Capital Depreciation	$456,049	$456,049	$456,049	$619,917
Total Annual Costs	**$836,734**	**$971,257**	**$995,351**	**$1,175,373**
Material Revenue	$253,221	$505,012	$757,519	$705,248
Net Cost / (Revenue)	**$583,513**	**$466,245**	**$237,833**	**$470,125**
Net Operating Cost per HH per Year	$29.01	$23.18	$11.83	$23.38
Net Operating Cost per Ton	$220.29	$88.26	$30.01	$53.07

The following chart shows the analysis for a mini MRF in dual stream configurations. For this scenario, the capital required has been cut almost in half from the full-scale MRF. The facility is quite similar to the process fiber only facility described earlier, with a bit of creativity to make it work for both streams of material. The three columns show the improved financial performance that is achieved for the dual stream MRF as tonnage increases, at significantly lower break-even points than a full-sized MRF.

The chart shows assuming the County needs to provide a revenue share with the towns in order to guarantee their tonnage from the transfer stations then approximately 2,000 tons more would need to be attracted for the facility to breakeven, assuming a $25 per fiber ton revenue share. This level of additional tonnage from the surrounding region (see Attachment A) is a practical goal. Likely arrangements from two of the three larger towns (Springfield, Hartford and Lebanon) would be enough to secure the critical tonnage. Two other variables should be considered: (1) less of a revenue share can be offered to Claremont and other towns that will benefit significantly from reduced hauling costs could significantly reduce that revenue share cost, and (2) depreciation does not need to be fully funded at the start of the project. Funding depreciation at less than 100% to start would allow the facility to breakeven at lower tonnage levels. This may not be possible if the facility is bond financed, but the terms might be much longer than the 20 years assumed for the building.

DUAL STREAM MINI MRF TONNAGE COMPARISON			
	Dual Stream Current	**Dual Stream Predicted**	**Dual Stream PAYT**
Fiber Tonnage	1,957	3,903	5,465
Container Tonnage	559	1,115	1,561
Residue	132	264	370
Total Tonnage	**2,649**	**5,283**	**7,396**
Capital			
Building @ 15,000 sf	$1,261,000	$1,261,000	$1,261,000
Separation & Baling Equipment	$898,150	$898,150	$898,150
Rolling Stock (Loader, etc)	$200,100	$200,100	$200,100
Total	**$2,359,250**	**$2,359,250**	**$2,359,250**
Operating			
Number of Employees	7	9	10
Annual Labor Cost (incl Fringes)	$264,661	$319,989	$347,653
Annual O&M Costs	$70,652	$94,968	$114,476
Annual Capital Depreciation	$243,414	$243,414	$243,414
Total Annual Costs	**$578,728**	**$658,372**	**$705,544**
Material Revenue	$253,221	$505,012	$707,017
Net Cost / (Revenue)	**$325,507**	**$153,359**	**($1,474)**
Net Operating Cost per HH per Year	$16.18	$7.63	($0.07)
Net Operating Cost per Ton	$122.89	$29.03	($0.20)
Revenue Share with Towns @ $25 per Fiber Ton	$48,929	$97,582	$136,615
Net Cost / (Revenue)	**$374,437**	**$250,942**	**$135,141**
Net Cost per HH	$18.62	$12.48	$6.72
Net Operating Cost per Ton	$141.36	$47.50	$18.27
Necessary Merchant Tonnage to Breakeven with Revenue Share for All Fiber Tons	**6,744**	**4,110**	**1,997**

The next chart shows the analysis for a mini MRF in single stream configurations. The three columns show the improved financial performance that is achieved for the single stream MRF as tonnage increases, at significantly lower break-even points than a full-sized MRF yet still higher tonnage levels than the dual stream mini MRF. The single stream MRF has the benefit of higher tonnages from projected collection programs, so the predicted tonnage in the far right column is 8,859 tons, higher than the 7,396 tons predicted for the dual stream PAYT option.

Similar to the dual stream case, the County will likely need to secure a total of 2,100 additional tons assuming a revenue share of $5 per ton. The issue with single stream is that the local transfer stations will likely not want to convert because it will mean a loss of revenue for them. The two main advantages of single stream are: (1) reducing curbside collection costs and (2) making recycling as convenient as trash. For many of the towns with developed recycling habits for the residents, the increase in material will likely not offset the loss in value.

SINGLE STREAM MINI MRF TONNAGE COMPARISON			
	Single Stream Current	**Single Stream Medium Tonnage**	**Single Stream Predicted**
Fiber Tonnage	1,957	3,721	6,201
Container Tonnage	559	1,063	1,772
Residue	132	532	886
Total Tonnage	**2,649**	**5,316**	**8,859**
Capital			
Building @ 15,000 sf	$1,261,000	$1,261,000	$1,261,000
Separation & Baling Equipment	$1,405,200	$1,405,200	$1,405,200
Rolling Stock (Loader, etc)	$200,100	$200,100	$200,100
Total	**$2,866,300**	$2,866,300	**$2,866,300**
Operating			
Number of Employees	7	9	10
Annual Labor Cost (incl Fringes)	$264,661	$319,989	$360,822
Annual O&M Costs	$75,774	$100,394	$133,109
Annual Capital Depreciation	$310,206	$310,206	$310,206
Total Annual Cost	**$650,642**	**$730,589**	**$804,137**
Material Revenue	$253,221	$423,149	$705,248
Net Cost / (Revenue)	**$397,421**	**$307,441**	**$98,889**
Net Operating Cost per HH per Year	$19.76	$15.29	$4.92
Net Operating Cost per Ton	$150.04	$57.84	$11.16
Revenue Share with Towns @ $5 per Ton	$13,244	$26,578	$44,296
Net Cost / (Revenue)	**$410,665**	**$334,018**	**$143,185**
Net Cost per HH	$20.42	$16.61	$7.12
Net Operating Cost per Ton	$155.04	$62.84	$16.16
Necessary Merchant Tonnage to Breakeven with Revenue Share for All Tons	**8,351**	**5,684**	**2,141**

V-B: PERFORMANCE ENHANCEMENTS FOR RECYCLING PROCESSING

Following are major trends in performance enhancement for recycling processing that deserve consideration in Sullivan County's recycling plans.

Single Stream Recycling: The move to single-stream recycling processing is the most significant development in the MRF capability over the last five plus years. Single-stream systems rely on a series of “disc screens” to separate bottles and cans from the paper stream in the early stages in the MRF processing system. This front-end system then feeds paper into the traditional and proven sorting systems that are nearly identical to the dual stream MRFs. The three weak points in single stream MRF performance are 1) cross contamination of paper by bottle/can material, especially glass, with some paper mills across the country well positioned to handle this contaminant removal task and others very poorly equipped; 2) high residue rates due to the "if it might be recyclable, throw it in" curbside approach and the lack of visual inspection of the materials as curb-carts are tipped, resulting in a higher fraction of non-recyclable material entering the MRF, which then results in a high residue rate; 3) some missed recovery of the recyclable fraction, often seen in older generation disc screen systems, resulting in additional residue. Some older single stream MRFs had residue rates

in excess of 20% while newer generation single stream MRFs are demonstrating residue rates below 10%. For this analysis a 12% residue rate has been used.

Smaller Mini-MRFs: Some of the areas of the country with lower population densities that are not able to realize the economies of scale of larger MRFs are able to succeed through simple handling systems, dual use sort lines and more unskilled labor. Single stream recycling is still very possible at lower tonnages with only a relatively small increase in capital. They will still be subject to the weak points illustrated above, but can mitigate them through modified collection systems, increased education and running the material through slower. These Mini-MRFs can also expand into "super drop-off centers" that can accept a much wider range of recyclables that are not economically collected at the curb. Many of these materials are currently accepted at the transfer stations, but could be expanded to include rechargeable batteries, motor oil, Styrofoam, mixed rigid plastics, plastic bags, pallets, clean wood waste, scrap metal, and hard cover books. These materials are often accepted at no charge. Small businesses and institutions unable to access effective recycling collection services can deliver valuable loads of office stock, corrugated and other homogenous recycling streams. There are also more difficult and/or expensive to recycle materials that can be accepted at a minor charge such as electronic waste, tires, clean concrete rubble, Freon charged appliances, etc. Small business customers are also interested in having legal outlets for problem, regulated and hazardous wastes such as these. These super drop-off MRFs have the potential to serve as take back centers as various states adopt bounty, deposit or advance disposal fee systems for certain problem materials (e.g. CRT screens). In all these examples, the additional fee based revenue streams help the smaller MRF to diversify and strengthen its overall funding base and also help the local community reach ever-higher diversion goals.

MRF Efficiency: An important trend in MRF operations of all sizes is continuous improvement in overall efficiency through upgraded equipment, increased receiving and storage areas, better layout, elimination of bottlenecks, optimization of labor use, improved ergonomics and related steps. Overall efficiency of these facilities is also greatly affected by decisions regarding materials acceptance and processing standards.

Specialized pieces of equipment are sometimes added with a good example being the use of eddy current separation systems for automated separation of aluminum, or density separation using trommels or air for different resin types. Glass is another good example where the approach has changed at many MRFs. Some high-volume MRFs have installed optical separation systems for glass to allow high throughput, low cost preparation of green, amber and/or flint cullet for regional glass furnaces. Many MRFs that are more distant from glass furnaces now work to minimize handling of glass by preparing it for a low value, low processing cost market such as aggregate. Some MRFs only take clear/flint glass and some take no glass at all. Optical separation is even being used to sort additional paper out of residue streams and aluminum cans from plastic. Corrugated cardboard and wood wastes are readily removed with special sort lines and/or screens. Commercially generated paper stock might require additional sorting to achieve required revenues, but may also be available at very low or no cost, allowing for less processing. In any event, fixed costs are spread over more tons more rapidly, lowering unit costs and improving return on capital.

Public/Private Partnerships: Public/Private Partnerships for financing and constructing recycling facilities, and Performance Based Contracting for their operation are increasingly effective techniques for public agencies undertaking recycling infrastructure development.

Private contractor roles in public sector MRF projects include:

- Long term franchise with private sector (specialty MRF developer) owning, financing, designing, constructing and operating the MRF on publicly owned land and processing a base load stream of recyclables guaranteed by public agency contracts. The MRF then seeks additional "Merchant MRF" tonnage in the open market, supported by the strong financial performance provided by the base load tons. The MRF and MRF equipment often revert to public sector ownership at the end of the franchise.
- Long term partnership with public ownership of some (e.g. land and building) or all of the MRF and private sector (specialty MRF developer) designing, constructing and operating the MRF.
- Shorter term partnerships with private sector operating a publicly owned MRF with payments to the public agency via revenue sharing, royalties, and contributions to public agency MRF equipment repair, renewal and replacement funds..
- Shorter term partnerships with private sector assisting in support services for publicly owned and operated MRF including marketing of materials, providing sorting staff, handling all equipment preventative maintenance, repair and replacement management, etc.

These approaches all take advantage of the resources and expertise of the private sector in its ability to capitalize, move rapidly, take on risk, manage risk, complete technical tasks, accomplish a building program, secure regional tonnage and market materials on a larger regional or national scale. These approaches carry a cost, but that cost is often less than the risk a public agency would take in developing a MRF on its own.

Performance Based Contracting: Having been adopted at the federal level as a goal for improved service contracting by public agencies, Performance Based Contracting has taken on an increasing role in public service procurement. These contracts establish performance targets for the service provider that will further the public agency mission and build longer term "partnerships" with the private service provider. These performance based targets are then integrated into both the specifications as well as the compensation system such that the service provider has financial and non-financial incentives to reach the performance targets and also has financial and non-financial dis-incentives for backsliding from performance targets. A well-designed metrics program is part of an effective performance based public/private partner contracting strategy both to establish meaningful performance based targets as well as track progress towards and reward reaching those targets. Recycling service contracting presents unique opportunities to use this contracting technique, especially in providing incentives for increased recovery from existing service recipients and in adding additional service capacity during a contract's term.

Key Findings

Advantages: Key advantages of these processing options include:

- For each MRF, increasing tonnage decreases cost per ton and increases revenue
- Both dual and single stream MRFs would likely need to attract around 2,000 tons or less in order to break even.
- A dual stream mini-MRF could be financially viable only with County Tons
- A single stream mini-MRF would still need to attract material from surrounding towns
- Dual Stream features:

- Lower residual waste rates (5%), higher commodity pricing, lower capital costs
- Lower processing cost per ton, producing net revenues at lower tonnages

- Single Stream features
  - May attract more outside recyclables
  - Can accept dual or single stream materials
- County control of its own MRF gives flexibility to:
  - Add materials at its own discretion
  - Gain significant revenue share from sale of recyclable materials
  - Use MRF capacity for other targeted non-curbside recyclables such as those that might be collected at super drop-offs
  - Leverage private sector recycling activity in the region
  - Position the County for even greater financial benefit as tonnage increases beyond the projections used in this analysis.

Disadvantages: Key disadvantages of these processing options include:

- High capital costs
- High fixed costs
- Single Stream
  - High residual rates (12%), lower commodity pricing, more capital intensive
  - Higher processing cost per ton
  - May not be attractive to drop-off programs

Key Variables and Risks:

- The County will need to move forward on its own MRF at its own financial risk
- Securing and controlling critical mass tonnage will be key to net revenue operations and a positive return on investment.
- As much as possible, material streams should be negotiated before building the facility with long-term contracts.
- The decision of single or dual stream will need to be weighed carefully. Buy-in from the town transfer stations is a must and higher revenue share arrangements for dual stream materials may be necessary to attract their material.

VI: COMPARISON OF OPTIONS – RECOMMENDATIONS

The results from the collection and processing analysis are integrated in this section to determine overall performance at different tonnage levels.

VI-A: LOW TONNAGE PROCESSING OPTIONS

The following chart shows the aggregate costs for each processing option at low tonnage. Since the low tonnage is the current volume collected by the County, no collection costs are factored in.

LOW TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	2,649	2,649	2,649	2,649	2,649
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$51,646	$61,871	$238,790	$335,314	$340,436
Total Annual Cost	**$132,674**	**$142,899**	**$456,835**	**$578,728**	**$650,642**
Material Revenue	$49,573	$6,361	$178,494	$253,221	$253,221
Net Cost	**$83,101**	**$136,538**	**$278,341**	**$325,507**	**$397,421**
Net Cost per HH per Year	$4.13	$6.79	$13.84	$16.18	$19.76
Net Cost per Ton	$31.37	$51.55	$105.08	$122.89	$150.04

As the data shows, transferring the materials at low tonnages is the most economical choice. In the near-term, transferring of recyclables could be used to consolidate material until the critical yearly tonnage is reached. In order for the County to receive this material, some of the material revenue will likely be transferred to the towns. The high capital costs of all processing options are prohibitive at the current tonnage. However, County investment in processing capabilities does send a strong message of commitment to recycling for the long-term.

V-B: MEDIUM TONNAGE PROCESSING OPTIONS

The following chart shows the aggregate costs for each processing option at medium tonnage and the collection costs for Claremont and Newport.

MEDIUM TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	5,283	5,316	5,283	5,283	5,316
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$84,297	$84,822	$280,913	$414,958	$420,383
Total Annual Costs	**$165,325**	**$165,850**	**$498,958**	**$658,372**	**$730,589**
Material Revenue	$98,866	$12,765	$355,980	$505,012	$423,149
Net Cost	**$66,459**	**$153,086**	**$142,978**	**$153,359**	**$307,441**
Net Cost per HH per Year	$3.30	$7.61	$7.11	$7.63	$15.29
Net Cost per Ton	$12.58	$28.80	$27.07	$29.03	$57.84

As the data shows, costs per ton decrease for these tons including collection over the low tonnage packages, except for the transfer all. The transfer options do not realize the economies of scale that the processing options do.

V-C: HIGH TONNAGE PROCESSING OPTIONS

The following chart shows the aggregate costs for each processing option at high tonnage with collection costs included for all four towns.

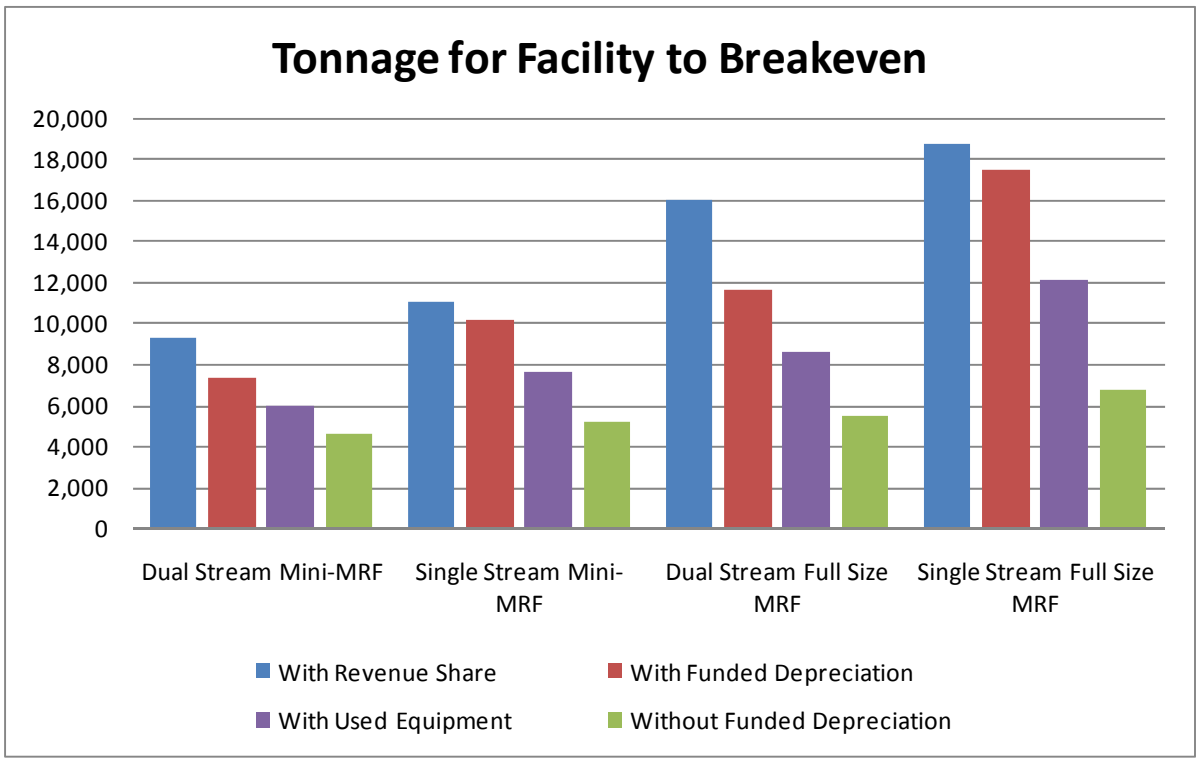
HIGH TONNAGE PROCESSING PACKAGES					
	Dual Stream Transfer All	**Single Stream Transfer All**	**Process Fiber Only**	**Dual Stream Mini-MRF**	**Single Stream Mini-MRF**
Tonnage	7,396	8,859	7,396	7,396	8,859
Capital Costs	$660,375	$660,375	$1,980,120	$2,359,250	$2,866,300
Annual Capital Amortization	$81,028	$81,028	$218,045	$243,414	$310,206
Operating Costs	$121,072	$141,439	$337,890	$462,129	$493,931
Total Annual Costs	**$202,101**	**$222,468**	**$555,934**	**$705,544**	**$804,137**
Material Revenue	$138,413	$21,275	$498,372	$707,017	$705,248
Net Cost	**$63,688**	**$201,193**	**$57,562**	**($1,474)**	**$98,889**
Net Cost per HH per Year	$3.17	$10.00	$2.86	($0.07)	$4.92
Net Cost per Ton	$8.61	$22.71	$7.78	($0.20)	$11.16

At the high tonnages the processing options are realizing the economies of scale and also the efficiencies of the single stream curbside collection.

V-D: COMPARATIVE ANALYSIS - RISK MITIGATION SUMMARY

The following areas of risk and risk mitigation strategies should be taken into account in the final decision on project direction and in the management of risk during project development and operation.

- Most of the risk in each of the options is tied to securing the critical tonnage to make it economically viable. The chart in this section shows breakeven tonnage levels for the different facility types shown above. It is clear that securing long term tonnage commitments is the key risk management strategy for this project. There are many factors to securing the tonnage that deserve more consideration:
  - Towns currently receive revenue from their materials at their recycling transfer stations and will likely need some compensation for them to send their material to a County facility. That compensation level should be negotiated given that the Towns also often incur shipping costs to market the material to more distant locations. The County facility, with a potentially much shorter haul distance, could justify a lower level of compensation than what is currently received.
  - For towns in the south and west of the County, the Keene MRF may as close or closer than a facility in Claremont. Again, compensation may need to reflect the Keene MRF arrangements they have set up and the potentially longer haul to the County facility.
  - Other out-of-county or out-of-system tons (e.g. local hauler with commercial cardboard dumpster route) can be great sources for additional tonnage. Yet Attachment A shows that the available tons are not large in number – yet could be critical to reaching the break even tonnage. Attracting out of County tonnage takes longer and is typically not an alternative until the facility is actually up and running.



- Securing and maintaining the required capital investment is another key area of risk;
  - Public financing has the advantage of providing longer loan term opportunities, allowing capital to be amortized over many years. That public financing will require guarantees (see organizational structure).
  - Public/private partnerships can leverage private investment (e.g. site improvements as well as hauling equipment for a recycling transfer facility), often requiring longer term contracting arrangements.
  - The analysis has assumed capital amortization in the form of funded depreciation. This is essentially a non-cash transaction of setting aside funds into a restricted capital renewal and replacement account. The public agency (presumably the county) could manage some of the financial risk with this account. It can be funded at less than 100% in early years, anticipating the first year with higher operating costs and lower tonnage levels – and then funded at more than 100% in later years when higher tonnage levels are pushing the MRF above the breakeven point and generating additional available cash. The chart in this section shows the breakeven tonnage levels when funded depreciation is excluded from the analysis and the breakeven point when funded depreciation is included. The former represents the tonnage target needed when the MRF needs to cover its actual fixed and variable costs before depreciation.
  - Finding used equipment and leasing existing buildings is another way to manage capital risk. It is hit or miss on availability and timing, but 50% reduction or more is possible in total capital required. The chart in this section shows the breakeven tonnage levels when a 50% reduction in required capital is taken into account.
- Co-locating the County facility with other public operations, preferably with recycling synergies can greatly reduce the capital and operation cost burden.

- Co-location with any public facility can avoid land purchase price, site infrastructure (roads, entry ways, etc.) and related administrative support functions.
- Co-location with public operations that have recycling synergies can also help reduce operating costs. For example, a recycling campus that includes a waste transfer station would allow site management to be spread across more operations, allow larger pieces of equipment (e.g. front-end loader) to split time across operations, and enable greater recovery from the waste operation, feeding more material to the recycling program. Co-locating with a waste transfer operation would make recycling transfer very economical in the short term. The capital estimates from the report by Peter Engel for a waste transfer station are around $1 million. With the current projections for waste and recycling, this facility could handle recyclables without increasing capital costs.

- Organizational structure is imperative to ensuring the long-term viability of any program that the County chooses. To this end a stable source of funding is a necessary first step. If stable funding is not available within the government to support the plan goals, private or public operating partners can be brought in to share the costs:
  - Long-term relationships should be pursued with all operating partners. This will help to maintain predictability of costs and revenues.
  - Long-term relationships should be cultivated with marketers or buyers of materials to better manage the variability of recycling commodities in the marketplace.

V-E: CONCLUSIONS AND NEXT STEPS

The results of the analysis will give the County the tools necessary to determine the best course of action for expanding their recycling programs in the near and long term. Following is a summary of the Key Recommendations and the next steps required to develop the project.

Key Recommendations

- In order to minimize risk to the County, recyclables should be consolidated at a recycling transfer station located, likely in Claremont. The facility can be co-located with a waste transfer station to minimize capital costs. Agreements can be negotiated with one of the area MRFs to accept the material and with the towns to deliver the material.
- During this period, negotiations should also take place with population centers in adjacent counties, working towards building a critical mass of tonnage needed to develop a dual stream mini-MRF as described below. A total of 1,500 to 3,000 additional tons should be secured from these sources.
- In order for the County to show a strong commitment to recycling, three programs are recommended to be developed over the next five years. Because of the lower tonnage, lower capital risk and history of dual stream collection at the transfer stations, a dual stream system collection and processing system is recommended.
  - Develop the curbside programs in the larger towns to increase recycling diversion either through municipally run collection programs, private contracts or non-exclusive hauler licensing. An education and marketing campaign should accompany this rollout to generate interest and promote participation. Expanded recycling collection programs like these are essential to secure an additional 2,000 to 2,500 tons of recyclables needed to justify a County MRF.
  - A county-wide Pay-As-You-Throw program should be developed to encourage

recycling and educate the residents about the full costs of waste disposal. Again, this would be implemented through ordinance and hauler licensing requirements.

- A dual stream mini-MRF is recommended once a comfortable critical tonnage has been reached. A processing facility will solidify the County's commitment to recycling, provide a long-term stable alternative to waste disposal, encourage significant diversion from the waste stream and educate the next generation of recyclers.

Next Steps

The following next steps are recommended should the County decide to proceed with the recycling processing project.

1. Define Project by selecting the recommended options or alternatives to those options, including near term starting point project and longer term project vision.
2. Further develop organizational structure and operating entity
    a. Identify and secure preliminary commitment of project partners
    b. Establish decision making and implementation entity (county public works, authority, quasi public non-profit or intergovernmental agency project).
    c. Define and develop "rules" including intergovernmental contracts, ordinances, bylaws, etc. as needed to implement project.
    d. Establish organizational structure, goals, mission, job descriptions and policies and procedures.
3. Further Develop Physical Project
    a. Identify site based on site requirements and potential co-location opportunities
    b. Conceptual site plan development including facility/equipment layout
    c. Upgrade capital cost projections
    d. Project timeline
    e. Site plan submittal
    f. Necessary approvals
    g. Equipment specifications and procurement documents
    h. Facility design, construction drawing development and procurement
    i. Construction management and start-up testing
4. Line up Project Financing and Funding Mechanisms
    a. Must start as soon as possible
    b. Evaluate and recommend public and private sources of capital
    c. Evaluate and recommend public operational funding
    d. Implement recommended project financing and funding mechanisms
5. Develop Operating Partnerships
    a. Arrangements with Nearby MRF (e.g. Keene) Including Contract
    b. Arrangements with public operating partners (e.g. host agency services)
    c. Arrangements with private operating partners (e.g. haulers)
    d. Arrangements with markets if needed
6. Secure Recycling Tonnage to Direct to MRF

a. Negotiations with towns for curbside program and recycling transfer station tons.
b. Technical assistance in growing recycling collection capacity (e.g. setting up curbside recycling contracts with tonnage directed to the County Facility).
c. Negotiations with private haulers for their own captive recycling tons
d. Negotiations with nearby communities from surrounding counties for their captive recycling tons.

SULLIVAN COUNTY RECYCLING
COLLECTION AND PROCESSING OPTIONS

Attachment A:
Material Map of Sullivan County and Surrounding Communities

SULLIVAN COUNTY RECYCLING
COLLECTION AND PROCESSING OPTIONS

Attachment B:
Detailed Sample Capital and Operating Pro-Formas for Each Option

CLAREMONT CURBSIDE - Year 2008-2009	Dual Stream	DS PAYT	Single Stream
Summary			
Estimated Tonnage	1,660	2,324	2,818
Routes	6	9	7
Number of Households	6,074	6,074	6,074
Capital			
Curbside Trucks	$400,000	$400,000	$320,000
Backup Trucks (used)	$100,000	$100,000	$100,000
Curbside Bins (4,134 @ $4.50/unit)	$54,666	$54,666	$0
Curb Carts (2,067 @ $40/unit)	$0	$0	$242,960
Total Capital Requirement	$554,666	$554,666	$662,960
Operating			
Amortization of Capital @ 5%	$84,440	$84,440	$96,448
Labor @ $14.40/hour	$59,904	$59,904	$59,904
Labor Fringes	$25,958	$25,958	$25,958
Labor Backup @ $14.40/hour	$4,992	$4,992	$4,992
O&M (See Note #1)	$64,500	$64,500	$64,500
Total Operating	$239,795	$239,795	$251,802
Cost per Household	**$39.48**	**$39.48**	**$41.46**
Cost per Ton	**$144.45**	**$103.18**	**$89.35**

Note #1: Operating Cost O&M includes Direct Costs (Insurance/License/Fees/Fuel/Tires/Parts)

NEWPORT CURBSIDE - Year 2008-2009	Dual Stream	DS PAYT	Single Stream
Summary			
Estimated Tonnage	757	1,060	1,269
Routes	3	4	3
Number of Households	2,633	2,633	2,633
Capital			
Curbside Trucks	$200,000	$200,000	$160,000
Backup Trucks (used)	$100,000	$100,000	$100,000
Curbside Bins (5,266 @ $4.50/unit)	$23,697	$23,697	$0
Curb Carts (2,633 @ $40/unit)	$0	$0	$105,320
Total Capital Requirement	$323,697	$323,697	$365,320
Operating			
Amortization of Capital @ 5%	$49,485	$49,485	$53,867
Labor @ $14.40/hour	$29,952	$29,952	$29,952
Labor Fringes	$12,979	$12,979	$12,979
Labor Backup @ $14.40/hour	$2,496	$2,496	$2,496
O&M (See Note #1)	$43,000	$43,000	$43,000
Total Operating	$137,913	$137,913	$142,294
Cost per Household	**$52.38**	**$52.38**	**$54.04**
Cost per Ton	**$182.18**	**$130.11**	**$112.13**

Note #1: Operating Cost O&M includes Direct Costs (Insurance/License/Fees/Fuel/Tires/Parts)

SUNAPEE CURBSIDE - Year 2008-2009	Dual Stream	DS PAYT	Single Stream
Summary			
Estimated Tonnage	709	993	1,067
Routes	5	7	5
Number of Households	2,143	2,143	2,143
Capital			
Curbside Trucks	$200,000	$400,000	$160,000
Backup Trucks (used)	$100,000	$100,000	$100,000
Curbside Bins (4,286@ $4.50/unit)	$19,287	$19,287	$0
Curb Carts 2,143 @ $40/unit)	$0	$0	$85,720
Total Capital Requirement	$319,287	$519,287	$345,720
Operating			
Amortization of Capital @ 5%	$48,914	$79,859	$51,329
Labor @ $14.40/hour	$29,952	$59,904	$29,952
Labor Fringes	$12,979	$25,958	$12,979
Labor Backup @ $14.40/hour	$2,496	$4,992	$2,496
O&M (See Note #1)	$43,000	$64,500	$43,000
Total Operating	$137,341	$235,213	$139,756
Cost per Household	**$64.09**	**$109.76**	**$65.22**
Cost per Ton	**$193.71**	**$236.87**	**$130.98**

Note #1: Operating Cost O&M includes Direct Costs (Insurance/License/Fees/Fuel/Tires/Parts)

CHARLESTOWN CURBSIDE - Year 2008-2009	Dual Stream	DS PAYT	Single Stream
Summary			
Estimated Tonnage	580	812	998
Routes	4	6	4
Number of Households	2,067	2,067	2,067
Capital			
Curbside Trucks	$200,000	$400,000	$160,000
Backup Trucks (used)	$100,000	$100,000	$100,000
Curbside Bins (4,134 @ $4.50/unit)	$18,603	$18,603	$0
Curb Carts (2,067 @ $40/unit)	$0	$0	$82,680
Total Capital Requirement	$318,603	$518,603	$342,680
Operating			
Amortization of Capital @ 5%	$48,826	$79,770	$50,935
Labor @ $14.40/hour	$29,952	$59,904	$29,952
Labor Fringes	$12,979	$25,958	$12,979
Labor Backup @ $14.40/hour	$2,496	$4,992	$2,496
O&M (See Note #1)	$43,000	$64,500	$43,000
Total Operating	$137,253	$235,124	$139,362
Cost per Household	**$66.40**	**$113.75**	**$67.42**
Cost per Ton	**$236.64**	**$289.56**	**$139.64**

Note #1: Operating Cost O&M includes Direct Costs (Insurance/License/Fees/Fuel/Tires/Parts)

TRANSFER DUAL-STREAM RECYCLING TO TRANSFER TRAILERS

CONSTANTS	Current	Dual Stream	DS w/PAYT
Number of Tractors	1	1	1
Number of Trailers	2	2	2
DAILY TONNAGE			
Paper (tons/day)	7.8	15.5	21.7
Containers (tons/day)	2.4	4.8	6.7
YEARLY TONNAGE			
Paper (tons/year)	2,023	4,035	5,650
Containers (tons/year)	625	1,247	1,746
TRIPS			
Paper (trips/year)	92	183	257
Containers (trips/year)	69	139	194
Total Trips per Year	**161**	**322**	**451**
VOLUME			
Paper (cy/day)	75	149	209
Containers (cy/day)	38	77	107
Paper Tip Area	605	1207	1690
Container Tip Area	312	622	870
Total Tip Area	**917**	**1829**	**2560**

Assumptions		
Driver Wages	$33,720	
Benefits	33%	
Truck Cost	$200,000	
Interest Rate	4.50%	
Truck Life	7	yrs
Maintenance	5%	
Misc	10%	
Mileage	5.5	mpg
Fuel	$3.50	
Paper	22	tons/trip
Containers	9	tons/trip
Load Time	1	hrs
Unload Time	0.5	hrs
Driving Time (Containers)	1.5	hrs
Miles to Container MRF	45	miles
Driving Time (Fiber)	1.5	
Miles to Fiber MRF	45	miles
Time per Trip (Containers)	4.5	hrs
Time per Trip (Fiber)	4.5	
Loading Area	2000	sf
Peaking Factor	20%	
Equipment Operator	$17.82	/hour
Maintenance	$14.76	/hour
Mixed Paper	250	lbs/cy
Mixed Containers	150	lbs/cy
Building Life	20	yrs
Wheel Loader Cost	$126,000	
Revenue Share	$25	per ton
Trigger Point	$0	
Average Revenue	$95.60	per ton
Revenue Share	0%	

ANNUAL COSTS		Current		Dual Stream		DS w/PAYT	
Item	**Cost**	**#**	**Total**	**#**	**Total**	**#**	**Total**
Truck Cost	$33,940.29	1	$33,940	1	$33,940	1	$33,940
Maintenance	$10,000.00	1	$10,000	1	$10,000	1	$10,000
Driver	$44,847.60	0	$15,697	1	$22,424	1	$44,848
Transfer Pad Cost per sqft	$55.73	6,000	$25,705	6,000	$25,705	6,000	$25,705
Wheel Loader Cost	$21,382.38	1	$21,382	1	$21,382	1	$21,382
Operating Costs	$42,651.97	0.5	$21,326	1.0	$42,652	1.3	$53,315
		Total:	**$128,051**	**Total:**	**$156,104**	**Total:**	**$189,191**

TRIP COSTS	Current	Dual Stream	DS w/PAYT
Capital Cost per Trip	$793.07	$484.77	$419.66
Total:	**$793.07**	**$484.77**	**$419.66**
PAPER			
Gas per trip	$28.64	$28.64	$28.64
Cost	$75,574	$94,173	$115,121
Trips per day	0.4	0.7	1.0
Trips per week	2.0	4.0	5.0
Time per week (hrs)	9.0	18.0	22.5
CONTAINERS			
Gas per trip	$28.64	$28.64	$28.64
Cost	$55,110	$67,184	$81,424
Trips per day	0.3	0.5	0.7
Trips per week	2.0	3.0	4.0
Time per week (hrs)	9	13.5	18
SUMMARY			
Total Trips per week	4	7	9
Time per week (hrs)	14.0	24.5	31.5
Overtime Price increase	$0	$0	$0
Total Cost:	**$130,685**	**$161,357**	**$196,544**
Fiber Revenue Share:	**$49,573**	**$98,866**	**$138,413**
Net Cost:	**$81,112**	**$62,490**	**$58,132**
Cost per Ton:	**$30.62**	**$11.83**	**$7.86**

Total Capital Costs	**$660,375**	**$660,375**	**$660,375**

DETAILED BUILDING BREAKDOWN			
Description	**Units**	**Cost/Unit**	**Total Cost**
Grading/Paving			$50,000
Building	6,000	15	$90,000
Foundation/Concrete Work			$87,500
Site/Utilities			$20,000
Electrical			$5,000
Plumbing/HVAC/Fire			$15,000
SUBTOTAL			$267,500
Contingency	10.0% of total	$267,500	$26,750
Engineering/Construction Inspection	15.0% of total		$40,125
		TOTAL COST	**$334,375**
		Cost per sq.ft	**$55.73**

TRANSFER PAD OPERATING COSTS			
Description	**Units**	**Unit Cost**	**Cost**
Loader Operator	0.5 FTE	$37,066	$18,533
Equipment Maintenance	0.10 FTE	$30,701	$3,070
Workman's Comp & Overhead	33%	$21,603	$7,129
Wheel Loader	161	$40.85	$6,596
Equipment Maintenance	2,649	$0.50	$1,324
Building Maintenance & Utilities	6,000	$1.00	$6,000
Total Annual Labor, O&M Cost=			$42,652

PROCESS FIBER AND HAUL CONTAINERS

Capital Costs				rate	5%	
		Cost	Life	Recovery	Annual Cost	
Facility	Building	$942,500	20	-$75,628.64	$75,629	
Facility	Main Baler and Conveyors	$329,065	10	-$42,615.42	$42,615	
Facility	Fiber Line and Feed	$225,300	10	-$29,177.38	$29,177	
Facility	Wheel Loader	$126,000	10	-$16,317.58	$16,318	
Facility	Skid Steer (Bobcat)	$24,000	10	-$3,108.11	$3,108	
Facility	Forklift	$24,000	10	-$3,108.11	$3,108	
	Equipment Only Subtotal	$728,365				
Facility	Equipment Contingency 5.0% of total	$36,418	10	-$4,716.33	$4,716	
Facility	Equipment Engineering/Inspection 10.0% of total	$72,837	10	-$9,432.66	$9,433	
					Total Capital Cost =	$184,104

Facilities and O&M Costs					
		Units	Unit Cost	Cost	
Labor	Fiber Sorting	2.0 FTE	$20,800	$ 41,600	
Labor	Loader Operator	1.0 FTE	$33,093	$ 33,093	
Labor	Equipment Operation/Maintenance	1.0 FTE	$30,701	$ 30,701	
Labor	Supervisor/Manager	0.5 FTE	$52,000	$ 26,000	
Labor	Workman's Comp & Overhead	33%	$131,394	$ 43,360	
Operating	Administrative Costs	4,035	$1.00	$ 4,035	
Operating	Energy	4,035	$1.00	$ 4,035	
Operating	Baler Wire	4,035	$1.50	$ 6,053	
Operating	Wheel Loader	388	$40.85	$ 15,850	
Operating	Forklift	97	$35.58	$ 3,451	
Operating	Skid Steer	194	$32.77	$ 6,358	
Operating	Equipment Maintenance	4,035	$1.15	$ 4,641	
Operating	Building Maintenance	12,000	$1.00	$ 12,000	
Operating	Building utilities	12,000	$1.00	$ 12,000	
Disposal	Waste Disposal	5% of total	$40 /ton	$ 8,071	
			Total Annual Labor, O&M Cost=		$251,248
				Total Costs =	$435,352
				Market Revenue =	$355,980
				Net Profit =	-$79,372

Assumptions		
Fiber Sorting	2	tons/hr/person
Container Sorting	0.5	tons/hr/person
Peaking Factor	20%	
Sorter Wage	$10.00	/hour
Equipment Operator	$15.91	/hour
Maintenance	$14.76	/hour
Manager	$25.00	/hour
Fiber Tonnage	4,035	tons
Container Tonnage	1,247	tons

Annual Tonnage	Residual Rate	Gross Cost/Ton	Break Even Tip Fee	Net Cost/Ton	Avg Sale Price/Ton	Tons/Day
4,035	5.00%	$107.88	$17	$20	$91.20	16

Detailed Building Breakdown

Description	Units	Cost/Unit	Total Cost
Grading/Paving			$100,000
Building	12,000	$15	$180,000
Foundation/Concrete Work			$120,000
Rollup Doors	5	$25,000	$125,000
Site/Utilities			$80,000
Electrical			$45,000
Plumbing/HVAC/Fire			$75,000
Office	1,000	$75	$75,000
SUBTOTAL			$725,000
Contingency	15.0% of total	$725,000	$108,750
Engineering/Construction Inspection	15.0% of total		$108,750
TOTAL COST			**$942,500**

Detailed Baler Breakdown

Description	Units	Cost/Unit	Total Cost
Baler incl. Freight & Installation			$255,065
Conveyors			$74,000
TOTAL COST			**$329,065**

Detailed Fiber Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors			$97,300
Steel Supports / Stairs / Ladders			$38,000
Electrical Control Systems			$24,000
Installation / Freight			$62,000
Bins	4	1000	$4,000
TOTAL COST			**$225,300**

Hauling Containers			
Annual Costs		**Current**	
Item	**Cost**	**#**	**Total**
Truck Cost	$33,940	1	$33,940
Maintenance	$10,000	1	$10,000
Driver	$44,848	0.4	$15,697
		Total:	**$59,637**

Hauling Containers		
Tons	1,247	
Total Trips	139	
Gas per trip	$28.64	
Trips per day	0.5	
Trips per week	3.0	
Time per week (hrs)	13.5	hrs
Net Cost	$63,606	
Cost per Ton	**$50.99**	

Total Cost	
Container Total	$63,606
Fiber Processing	$435,352
Market Revenue	$355,980
Net Cost	$142,978
Revenue/Ton	**-$27.07**

FULL SIZE DUAL STREAM MRF

Capital Costs				rate	5%	
		Cost	Life	Recovery	Annual Cost	
Facility	Building	$2,704,000	20	-$216,975.96	$216,976	
Facility	Main Baler and Conveyors	$460,455	10	-$59,631.03	$59,631	
Facility	Fiber Line and Feed	$202,300	10	-$26,198.78	$26,199	
Facility	Container Line and Feed	$628,000	10	-$81,328.87	$81,329	
Facility	Wheel Loader	$126,000	10	-$16,317.58	$16,318	
Facility	Skid Steer (Bobcat)	$24,000	10	-$3,108.11	$3,108	
Facility	Forklift (2)	$48,000	10	-$6,216.22	$6,216	
	Equipment Only Subtotal	$1,488,755				
Facility	Performance Bond 4.0% of total	$59,550	10	-$7,712.02	$7,712	
Facility	Equipment Contingency 5.0% of total	$74,438	10	-$9,640.03	$9,640	
Facility	Equipment Engineering/Inspection 15.0% of total	$223,313	10	-$28,920.09	$28,920	
				Total Capital Cost =		$456,049

Facilities and O&M Costs					
		Units	Unit Cost	Cost	
Labor	Fiber Sorting	3.0 FTE	$ 20,800	$ 62,400	
Labor	Container Sorting	3.0 FTE	$ 20,800	$ 62,400	
Labor	Loader Operator	1.0 FTE	$ 33,093	$ 33,093	
Labor	Equipment Operation/Maintenance	2.0 FTE	$ 30,701	$ 61,402	
Labor	Supervisor/Manager	1.0 FTE	$ 52,000	$ 52,000	
Labor	Workman's Comp & Overhead	33%	$ 271,294	$ 89,527	
Operating	Administrative Costs	5,283	$1.00	$ 5,283	
Operating	Energy	5,283	$0.89	$ 4,702	
Operating	Baler Wire	4,349	$2.00	$ 8,699	
Operating	Wheel Loader	381	$40.85	$ 15,562	
Operating	Forklift	254	$35.58	$ 9,036	
Operating	Skid Steer	254	$32.77	$ 8,323	
Operating	Capital Expenditure	1	$35,000	$ 35,000	
Operating	Equipment Maintenance	5,283	$1.00	$ 5,283	
Operating	Building Maintenance	25,000	$1.00	$ 25,000	
Operating	Building utilities	25,000	$1.50	$ 37,500	
		Total Annual Labor, O&M Cost=			$515,208
				Total Costs	$971,257
				Market Revenue =	$505,012
				Net Profit =	-$466,245

Assumptions	
Fiber Sorting	1.5 tons/hr/person
Container Sorting	0.4 tons/hr/person
Peaking Factor	20%
Sorter Wage	$10.00 /hour
Equipment Operator	$15.91 /hour
Maintenance	$14.76 /hour
Manager	$25.00 /hour
Fiber Tonnage	3,903 tons
Container Tonnage	1,115 tons

Annual Tonnage	Residual Rate	Gross Cost/Ton	Break Even Tip Fee	Net Cost/Ton	Avg Sale Price/Ton	Tons/Day
5,283	5.00%	$183.86	$88	$88	$95.60	20

Detailed Building Breakdown

Description	Units	Cost/Unit	Total Cost
Grading/Paving			$400,000
Building	25,000	25	$625,000
Foundation/Concrete Work			$350,000
Loading Docks	3	25000	$75,000
Rollup Doors	6	25000	$150,000
Site/Utilities			$80,000
Electrical			$86,000
Plumbing/HVAC/Fire			$134,000
Office w/Educational Space	2,400	75	$180,000
SUBTOTAL			$2,080,000
Contingency	15.0% of total	$2,080,000	$312,000
Engineering/Construction Inspection	15.0% of total		$312,000
TOTAL COST			**$2,704,000**

Detailed Baler Breakdown

Description	Units	Cost/Unit	Total Cost
Baler incl. Freight & Installation			$305,255
Conveyors			$155,200
TOTAL COST			**$460,455**

Detailed Container Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors (see separate spreadsheet)			$165,000
Steel Supports / Stairs / Ladders			$82,000
Bins	5	4500	$22,500
Trom-Mag / Air Classifier			$74,000
Eddy Current			$55,000
Electrical Control Systems			$59,000
Installation / Freight			$154,000
Glass Bunker	3	5500	$16,500
TOTAL COST			**$628,000**

Detailed Fiber Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors			$97,300
Steel Supports / Stairs / Ladders			$38,000
Electrical Control Systems	incl. above		
Installation / Freight			$62,000
Bins	5	1000	$5,000
TOTAL COST			**$202,300**

SINGLE STREAM FULL SIZE MRF

Capital Costs				rate	5%	
		Cost	Life	Recovery	Annual Cost	
Facility	Building	$2,899,000	20	-$232,623.26	$232,623	
Facility	Main Baler and Conveyors	$460,455	10	-$59,631.03	$59,631	
Facility	Container/Paper Separation	$768,000	10	-$99,459.51	$99,460	
Facility	Fiber Line and Feed	$202,300	10	-$26,198.78	$26,199	
Facility	Container Line and Feed	$783,000	10	-$101,402.08	$101,402	
Facility	Wheel Loader	$126,000	10	-$16,317.58	$16,318	
Facility	Skid Steer (Bobcat)	$24,000	10	-$3,108.11	$3,108	
Facility	Forklift (2)	$48,000	10	-$6,216.22	$6,216	
	Equipment Only Subtotal	$2,411,755				
Facility	Performance Bond 4.0% of total	$96,470	10	-$12,493.33	$12,493	
Facility	Equipment Contingency 5.0% of total	$120,588	10	-$15,616.67	$15,617	
Facility	Equipment Engineering/Inspection 15.0% of total	$361,763	10	-$46,850.00	$46,850	
				Total Capital Cost =		$619,917

Facilities and O&M Costs					
		Units	Unit Cost	Cost	
Labor	Fiber Sorting	3.0 FTE	$ 20,800	$ 62,400	
Labor	Container Sorting	3.0 FTE	$ 20,800	$ 62,400	
Labor	Loader Operator	1.0 FTE	$ 33,093	$ 33,093	
Labor	Equipment Operation/Maintenance	2.0 FTE	$ 30,701	$ 61,402	
Labor	Supervisor/Manager	1.0 FTE	$ 52,000	$ 52,000	
Labor	Workman's Comp & Overhead	33%	$ 271,294	$ 89,527	
Operating	Administrative Costs	8,859	$1.00	$ 8,859	
Operating	Energy	8,859	$0.89	$ 7,885	
Operating	Baler Wire	6,910	$2.00	$ 13,820	
Operating	Wheel Loader	639	$40.85	$ 26,099	
Operating	Forklift	426	$35.58	$ 15,154	
Operating	Skid Steer	426	$32.77	$ 13,958	
Operating	Capital Expenditure	1	$25,000	$ 25,000	
Operating	Equipment Maintenance	8,859	$1.00	$ 8,859	
Operating	Building Maintenance	30,000	$1.00	$ 30,000	
Operating	Building utilities	30,000	$1.50	$ 45,000	
		Total Annual Labor, O&M Cost=			$555,456
				Total Costs	$1,175,373
				Market Revenue =	$705,248
				Net Profit =	-$470,125

Assumptions		
Fiber Sorting	1.5	tons/hr/person
Container Sorting	0.5	tons/hr/person
Peaking Factor	20%	
Sorter Wage	$10.00	/hour
Equipment Operator	$15.91	/hour
Maintenance	$14.76	/hour
Manager	$25.00	/hour
Fiber Tonnage	6,201	tons
Container Tonnage	1,772	tons

Annual Tonnage	Residual Rate	Gross Cost/Ton	Break Even Tip Fee	Net Cost/Ton	Avg Sale Price/Ton	Tons/Day
8,859	10.00%	$132.67	$53	$53	$79.61	34

Detailed Building Breakdown

Description	Units	Cost/Unit	Total Cost
Grading/Paving			$400,000
Building	30,000	25	$750,000
Foundation/Concrete Work			$350,000
Loading Docks	4	25000	$100,000
Rollup Doors	6	25000	$150,000
Site/Utilities			$80,000
Electrical			$86,000
Plumbing/HVAC/Fire			$134,000
Office w/Educational Space	2,400	75	$180,000
SUBTOTAL			$2,230,000
Contingency	15.0% of total	$2,230,000	$334,500
Engineering/Construction Inspection	15.0% of total		$334,500
TOTAL COST			**$2,899,000**

Detailed Baler Breakdown

Description	Units	Cost/Unit	Total Cost
Baler incl. Freight & Installation			$305,255
Conveyors			$155,200
TOTAL COST			**$460,455**

Detailed CP Separation Breakdown

Description	Units	Cost/Unit	Total Cost
CP Screen			$350,000
Steel Supports			$70,000
Installation/Freight			$162,000
Conveyors			$186,000
TOTAL COST			**$768,000**

Detailed Container Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors (see separate spreadsheet)			$165,000
Steel Supports / Stairs / Ladders			$82,000
Bins	5	4500	$22,500
Trom-Mag / Air Classifier			$74,000
Eddy Current			$55,000
Glass Crusher/Screen			$128,000
Electrical Control Systems			$86,000
Installation / Freight			$154,000
Glass Bunker	3	5500	$16,500
TOTAL COST			**$783,000**

Detailed Fiber Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors			$97,300
Steel Supports / Stairs / Ladders			$38,000
Electrical Control Systems	incl. above		
Installation / Freight			$62,000
Bins	5	1000	$5,000
TOTAL COST			**$202,300**

DUAL STREAM MINI-MRF

Capital Costs				rate	5%	
		Cost	Life	Recovery	Annual Cost	
Facility	Building	$1,261,000	20	-$101,185.90	$101,186	
Facility	Main Baler and Conveyors	$317,000	10	-$41,052.95	$41,053	
Facility	Fiber & Container Flex Line and Feed	$464,000	10	-$60,090.12	$60,090	
Facility	Wheel Loader	$126,000	10	-$16,317.58	$16,318	
Facility	Skid Steer (Bobcat)	$24,000	10	-$3,108.11	$3,108	
Facility	Forklift	$24,000	10	-$3,108.11	$3,108	
	Equipment Only Subtotal	$955,000				
Facility	Equipment Contingency 5.0% of total	$47,750	10	-$6,183.84	$6,184	
Facility	Equipment Engineering/Inspection 10.0% of total	$95,500	10	-$12,367.69	$12,368	
				Total Capital Cost =		$243,414

Facilities and O&M Costs						
			Units	Unit Cost	Cost	
Labor	Fiber Sorting		6.0 FTE	$ 20,800	$ 124,800	
Labor	Loader Operator		1.0 FTE	$ 33,093	$ 33,093	
Labor	Equipment Operation/Maintenance		1.0 FTE	$ 30,701	$ 30,701	
Labor	Supervisor/Manager		1.0 FTE	$ 52,000	$ 52,000	
Labor	Workman's Comp & Overhead		33%	$ 240,594	$ 79,396	
Operating	Administrative Costs		5,283	$1.00	$ 5,283	
Operating	Energy		5,283	$1.00	$ 5,283	
Operating	Baler Wire		4,349	$2.00	$ 8,699	
Operating	Wheel Loader		381	$40.85	$ 15,562	
Operating	Forklift		254	$35.58	$ 9,036	
Operating	Skid Steer		254	$32.77	$ 8,323	
Operating	Equipment Maintenance		5,283	$1.00	$ 5,283	
Operating	Building Maintenance		15,000	$1.00	$ 15,000	
Operating	Building utilities		15,000	$1.50	$ 22,500	
				Total Annual Labor, O&M Cost=		$414,958
					Total Costs	$658,372
					Market Revenue =	$505,012
					Net Profit =	-$153,359

Assumptions	
Fiber Sorting	1.5 tons/hr/person
Container Sorting	0.4 tons/hr/person
Peaking Factor	20%
Sorter Wage	$10.00 /hour
Equipment Operator	$15.91 /hour
Maintenance	$14.76 /hour
Manager	$25.00 /hour
Fiber Tonnage	3,903 tons
Container Tonnage	1,115 tons

Annual Tonnage	Residual Rate	Gross Cost/Ton	Break Even Tip Fee	Net Cost/Ton	Avg Sale Price/Ton	Tons/Day
5,283	5.00%	$124.63	$29	$29	$95.60	20

Detailed Building Breakdown

Description	Units	Cost/Unit	Total Cost
Grading/Paving			$150,000
Building	15,000	15	$225,000
Foundation/Concrete Work			$150,000
Loading Docks	3	25000	$75,000
Rollup Doors	3	25000	$75,000
Site/Utilities			$80,000
Electrical			$65,000
Plumbing/HVAC/Fire			$75,000
Office	1,000	75	$75,000
SUBTOTAL			$970,000
Contingency	15.0% of total	$970,000	$145,500
Engineering/Construction Inspection	15.0% of total		$145,500
TOTAL COST			**$1,261,000**

Detailed Baler Breakdown

Description	Units	Cost/Unit	Total Cost
Baler incl. Freight & Installation			$220,000
Conveyors			$97,000
TOTAL COST			**$317,000**

Detailed Fiber & Container Flex-Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors (see separate spreadsheet)			$125,000
Steel Supports / Stairs / Ladders			$45,000
Bins	10	3500	$35,000
Eddy Current & Magnet			$80,000
Electrical Control Systems			$25,000
Installation / Freight			$154,000
TOTAL COST			**$464,000**

SINGLE STREAM MINI-MRF

Capital Costs				rate	5%	
		Cost	Life	Recovery	Annual Cost	
Facility	Building	$1,261,000	20	-$101,185.90	$101,186	
Facility	Main Baler and Conveyors	$317,000	10	-$41,052.95	$41,053	
Facility	Container/Paper Separation	$390,000	10	-$50,506.78	$50,507	
Facility	Container & Fiber Flex Line and Feed	$464,000	10	-$60,090.12	$60,090	
Facility	Wheel Loader	$126,000	10	-$16,317.58	$16,318	
Facility	Skid Steer (Bobcat)	$24,000	10	-$3,108.11	$3,108	
Facility	Forklift	$24,000	10	-$3,108.11	$3,108	
	Equipment Only Subtotal	$1,345,000				
Facility	Equipment Contingency 5.0% of total	$67,250	10	-$8,709.18	$8,709	
Facility	Equipment Engineering/Inspection 15.0% of total	$201,750	10	-$26,127.55	$26,128	
				Total Capital Cost =		$310,206

Facilities and O&M Costs					
		Units	Unit Cost	Cost	
Labor	Fiber Sorting	6.0 FTE	$ 20,800	$ 124,800	
Labor	Loader Operator	1.0 FTE	$ 33,093	$ 33,093	
Labor	Equipment Operation/Maintenance	2.0 FTE	$ 30,701	$ 61,402	
Labor	Supervisor/Manager	1.0 FTE	$ 52,000	$ 52,000	
Labor	Workman's Comp & Overhead	33%	$ 271,294	$ 89,527	
Operating	Administrative Costs	8,859	$1.00	$ 8,859	
Operating	Energy	8,859	$1.00	$ 8,859	
Operating	Baler Wire	6,910	$2.00	$ 13,820	
Operating	Wheel Loader	639	$40.85	$ 26,099	
Operating	Forklift	426	$35.58	$ 15,154	
Operating	Skid Steer	426	$32.77	$ 13,958	
Operating	Equipment Maintenance	8,859	$1.00	$ 8,859	
Operating	Building Maintenance	15,000	$1.00	$ 15,000	
Operating	Building utilities	15,000	$1.50	$ 22,500	
		Total Annual Labor, O&M Cost=			$493,931
				Total Costs	$804,137
				Market Revenue =	$705,248
				Net Profit =	-$98,889

Assumptions	
Fiber Sorting	1.5 tons/hr/person
Container Sorting	0.5 tons/hr/person
Peaking Factor	20%
Sorter Wage	$10.00 /hour
Equipment Operator	$15.91 /hour
Maintenance	$14.76 /hour
Manager	$25.00 /hour
Fiber Tonnage	6,201 tons
Container Tonnage	1,772 tons

Annual Tonnage	Residual Rate	Gross Cost/Ton	Break Even Tip Fee	Net Cost/Ton	Avg Sale Price/Ton	Tons/Day
8,859	10.00%	$90.77	$11	$11	$79.61	34

Detailed Building Breakdown

Description	Units	Cost/Unit	Total Cost
Grading/Paving			$150,000
Building	15,000	15	$225,000
Foundation/Concrete Work			$150,000
Loading Docks	3	25000	$75,000
Rollup Doors	3	25000	$75,000
Site/Utilities			$80,000
Electrical			$65,000
Plumbing/HVAC/Fire			$75,000
Office	1,000	75	$75,000
SUBTOTAL			$970,000
Contingency	15.0% of total	$970,000	$145,500
Engineering/Construction Inspection	15.0% of total		$145,500
TOTAL COST			**$1,261,000**

Detailed Baler Breakdown

Description	Units	Cost/Unit	Total Cost
Baler incl. Freight & Installation			$220,000
Conveyors			$97,000
TOTAL COST			**$317,000**

Detailed Separation Breakdown

Description	Units	Cost/Unit	Total Cost
Disc Screen			$250,000
Steel Supports			$45,000
Installation/Freight			$50,000
Conveyors			$45,000
TOTAL COST			**$390,000**

Detailed Fiber & Container Flex-Line Breakdown

Description	Units	Cost/Unit	Total Cost
Conveyors (see separate spreadsheet)			$125,000
Steel Supports / Stairs / Ladders			$45,000
Bins	10	3500	$35,000
Eddy Current & Magnet			$80,000
Electrical Control Systems			$25,000
Installation / Freight			$154,000
TOTAL COST			**$464,000**